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ARCHAEOLOGICAL INVESTIGATIONS OF THE LITTLE CYPRESS BAYOU SITE (3CT50) CRITTENDEN COUNTY ARK.

By
A. Merrill Dicks
Carol S. Weed

VOLUME II

Prepared under
Contract No. DACW66-82-R-0064
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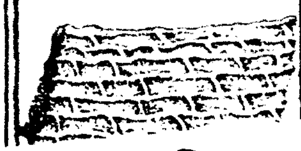
Memphis District



New World Research, Inc.
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ARCHAEOLOGICAL INVESTIGATIONS

OF

THE LITTLE CYPRESS BAYOU SITE
(3CT50)

CRITTENDEN COUNTY, ARKANSAS

Volume II - Appendices

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APPENDIX I

GEOMORPHOLOGY AND GEOMORPHIC HISTORY

by
John P. Lenzer

Introduction

Purpose

Geomorphic and stratigraphic studies were carried out as part of the archaeological investigation of the 3CT50 to provide data and geologic interpretations bearing on the following questions:

1) What landforms and drainage features were present during the prehistoric occupation or occupations;

2) Did environmental changes influence the occupation(s);

3) What geologic p. ocesses affected the site after final abandonment in prehistoric times and to what extent c d they do so; and

4) Could completely buried sites be present, and at what depths?

Methods

After preliminary background research, geological investigations were conducted on-site,, and in the area during archaeological field work, December 13-14, 1982; April 23-24, 1983. During those periods,

five trenches were excavated using a backhoe, and several archaeological test pits were deepened for stratigraphic information. Following field work, soil and topographic maps, and the archaeological stratigraphic reports were analyzed.

Fisk (1944) reported in detail on the geology, geomorphology and geomorphic history of the Mississippi River Alluvial Valley, basing his conclusions on the mass of U. S. Army Corps of Engineers (Corps) and private data available at that time. Since then, his absolute age determinations have been largely abandoned although the framework of his interpretation remains in use. Saucier (1970) has investigated both the Saint Francis Sink Lands west of the study area, and the Saint Francis Basin as a whole (Saucier 1964). The latter report involved mapping by U.S.G.S. 15 minute quadrangle, the geomorphic and stratigraphic features of the basin, using Fisk's data and additional information. Saucier's other extensive Corps mapping projects have subsequently led to his modification and simplification of Fisk's regional framework (Saucier 1974).

Two geological analyses of archaeological sites on Mississippi River meanders (both in Mississippi) also have been helpful in the 3CT50 geological interpretations. They are Saucier's (1977) analysis of the Teoc Creek site, and Gagliano and Weinstein's report (1979) on their cultural resources survey of the Upper Steele Bayou Basin.

Regional Background

At least eight major episodes of continental glaciation have occurred in the past three million years. During each of these periods of sea level fall and rise, the Mississippi River and its tributaries entrenched and widened the valleys which they had cut into the gently-dipping Tertiary sedimentary rocks of the Mississippi Embayment and Gulf Coastal Plain. The present Mississippi River Alluvial Valley is largely the product of erosion and deposition during the last 80,000 years. This span includes two major glaciation episodes, separated by a return of conditions like those of the present, and the geological present (or 'Holocene') which began some 10,000 to 11,000 years ago.

The geomorphic features of the valley floor in the region which includes 3CT50 are: 1) several levels of braided stream terrace (formed as floodplains when coarse glacial outwash clogged the ancestral Mississippi River and its tributaries; 2) relict and active meander belts built predominantly by the Mississippi River in the past 8000 years, after the glacial sediment supply was reduced; 3) the eastern wall of the alluvial valley (a line of low bluffs and hillslopes leading up to the dissected Tertiary bedrock uplands); and 4) Crowley's Ridge (a narrow, north/south elongated strip of Tertiary bedrock upland, which divides the Saint Francis Basin from the Western Lowlands). Figure I-1 and Table I-1 show Saucier's (1974) interpretation of the extent of these features, and their approximate dates of formation.

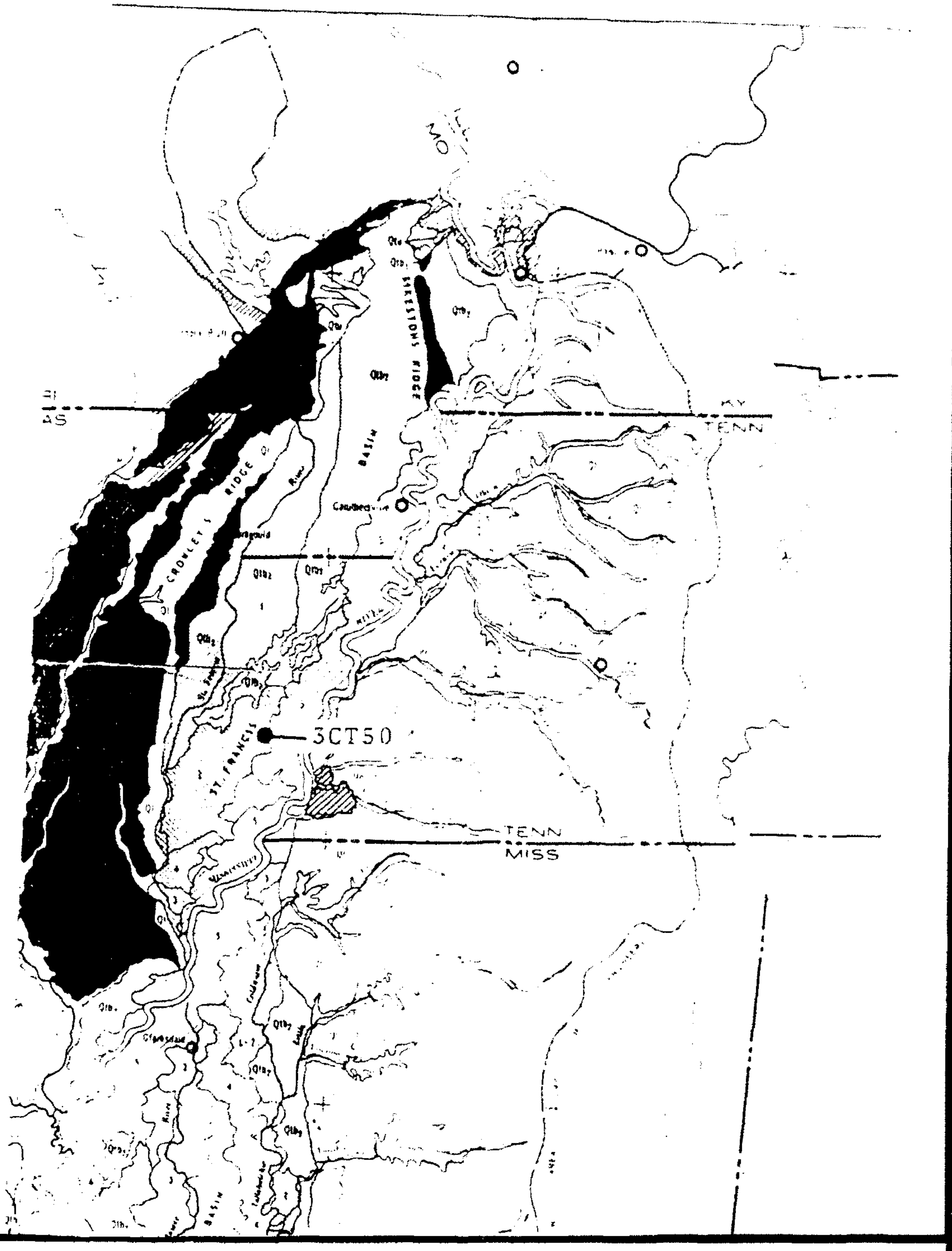

FIGURE I-1. GEOMORPHIC FEATURES IDENTIFIED IN GENERAL PROJECT VICINITY (from Saucier 1974: Deckerville section).

TABLE I-1. GEOMORPHIC CHRONOLOGY OF ST. FRANCIS BASIN REGION. (from Saucier 1974)

Approximate Years Ago	
4800 to present	Mississippi River occupies Numbers 4 and 5 meander belts against east side of valley (as far south as Memphis location).
6000 to 4600	Mississippi River occupies Number 3 meander belt.
? to 6000	Mississippi and Ohio rivers in braided courses on western and eastern sides of basin, respectively.

Historic and Prehistoric Earthquakes

Site 3CT50 lies approximately 13.5 km southeast of Marked Tree, Arkansas, in the New Madrid Seismic Zone. On 16 December, 1811, the first of a series of three major earthquake shocks occurred; this series is collectively termed the New Madrid Earthquake, the epicenter was probably in the vicinity of Marked Tree (McKeown 1982:3). No scarps or large-scale deformation have been reported in the present study area (Russ 1982:106 ff), however, 3CT50 lies within the zone of "sand blow" caused by the 1811-1812 earthquakes.

A sand blow is a thin patch of alluvial sand which was liquefied and forced up through cracks which developed in Mississippi River natural levees during earthquakes. Both the cracks and the mobilization of the saturated sands were caused by the seismic tremors. However, the overburden pressure of the natural levee deposits forced the sands up and out. Once covered by normal natural levee strata, these sand sheets would be difficult to distinguish from floodstage sand layers. Other earthquake effects in the study area probably included tree fall and extensive bank failure.

Since the shocks of 1811-1812, 20 damaging earthquakes and many micro-earthquakes have occurred in the New Madrid Seismic Zone (Nuttli 1982:15 ff). At least five earthquakes shook the Central Mississippi River alluvial valley between 1776 and 1804 (Nuttli 1982:15). The faults along which these earthquakes are generated are older than at least 60 million years and Russ (1982:111) summarizes the evidence for a recurrence interval of approximately 600 years for major earthquakes.

GEOMORPHIC FEATURES

Introduction

During the several glacial-interglacial cycles the Mississippi River and its larger tributaries have shifted between two basic states: meandering and braided. The following paragraphs combine a summary of the processes and products of these two states, with definitions of geomorphic and sedimentologic terms used in the other sections of this report. More detailed descriptions and explanations of the activities of major meandering and braided rivers can be found in Reineck and Singh (1975), Allen (1970), Leopold et al. (1964), Fisk (1944), and Russell (1936).

In its present meandering regime the mean-flow Mississippi River bedload is silt and fine sand, which is subordinate in mass to the suspended load of clay and silt. Several well-defined depositional and erosional environments comprise the meanders, which loop from side to side across a mean down-gradient axis.

The channel lies between erosional cutbanks, which generally occur on the outer, concave banks of meanders, and depositional point bars which form the inner, convex banks. Channel sediments are the coarsest complexly stratified deposits in the meandering river. Erosional and depositional processes are commonly inactive or reversed along segments of these two bank types. The prehistoric Mississippi River channel in this area was typically one to two kilometers wide. Individual meander-forms change as erosion and deposition proceed through annual cycles of spring and early summer floods, and periods of slow-flowing, low water. Lateral migration of a meander produces "ridge and swale," or "scroll" topography on the insides of meanders. This comprises a series of arcuate point bars separated by low, swamp parallel depressions. Distances between successive Mississippi River point bar crests are commonly around 500 m. Sudden changes in channel orientation, due to local cut-offs, create adjacent ridge and swale sets with different orientations. Point bar sediments are cross stratified and horizontally-stratified sand and silt.

Flooding also builds natural levees--elongated low ridges made of silt and sand which are dropped as the floodstage river rises over its banks and its velocity (hence its transporting power) is reduced. Clays settle when a flood begins to wane. The natural levees slope very gently down to the adjacent portions of the floodplain--the poorly drained backswamps. Levee widths of two to three kilometers on each side of the channel are common. The crests of the natural levees can be as high as two to three meters above adjacent backswamps. Backswamps aggrade very slowly compared to the natural levees. The sediments deposited in this environment are usually slow-settling clays of the suspended load.

The crests and the extensive sheets of sub-horizontal layers are broken at intersections of tributaries and cutoff meanders with the Mississippi River, and at crevasses. A crevasse is another floodstage

product of the river, formed when floodwaters concentrate in a low portion of a levee crest and cut a minor channel to the backswamp. Alluvial fans of silt and fine sand typically form where a crevasse channel spreads into distributaries. A crevasse can close up in a few years; it might also persist, deepen, and allow drainage from the backswamp back to the river during low-water periods.

Erosion sometimes leads to abandonment of a portion of a meander. An "oxbow lake" is formed when sand and silt bars close the ends of an abandoned meander. High water and overbank flooding eventually fill an oxbow lake with clay which is rich in organic material. Occasionally a series of meanders will be cut off, leaving an "abandoned course" or "relict meander belt." A meander belt comprises all of the features described above, except for bordering backswamps. An active meander belt bordering the Mississippi River is five to ten kilometers wide. The various Mississippi River Alluvial Valley histories have been based on the determination of relative ages of these abandoned courses.

This determination is based on cross-cutting relationships, and on gradual slope degradation and burial of inactive courses as valley floor aggradation proceeds. It is made more difficult by the presence of partial-flow courses, in which the main channel splits for some distances into two meandering courses. The reduced flow in each produces a reduction in meander dimensions. Other causes of interpretive confusion and lack of precision are the re-occupation of an abandoned meander belt, and the long-continued occupation of a single meander belt.

The braided Mississippi River was simpler in its types of geomorphic features and sedimentary environments, but more complex in its form. The sand bedload derived from glacial deposits which were winnowed by water from the melting continental glaciers to the north. The abundance of this sand caused the river to spread into rapidly-changing, anastomosing channels, separated by low, elongated, complexly-stratified bars. Silt and clay were important components of the sediment load, but the sand content controlled the form of the river.

Transitions between the meandering and the braided regime apparently occur geologically rapidly, in response to changes in discharge, sediment load and valley slope (Schumn 1977:159; Leopold et al. 1964:293). Saucier (1974:19-21) suggested that a braided stream regime of the Mississippi River in the Saint Francis Basin lasted from approximately 18,000 years ago to perhaps 6000 years ago. When the Mississippi River shifted its course from the west side of Sikeston Ridge to the east side, the Mississippi and Ohio rivers joined, and rapidly formed a meander belt along the eastern side of the alluvial valley.

Big Creek-Mississippi River Meander Belt

The relict Big Creek-Mississippi Meander Belt comprises three well-formed and well-preserved meanders which loop from south of Turrell, Arkansas, westward and northwestward to a point some 13 km west of Turrell (Figure I-2). The channel length in this segment is approximately 30.5 km. The filled channel is best seen south and southwest of Turrell, where it is a low, flat-floored strip 0.5 to 1.0 km wide, which lies 1.5 m lower than the adjacent point bar and natural levee terrain (Figure I-3).

Through most of the meander belt the filled channel contains the locally sinuous course of Big Creek. This course is relatively straight around the meander at 3CT50; however, farther upstream and downstream, it crosses point bar terrain, and exhibits meanders appropriate to the size of this stream. Backswamp drainage streams occupy a few portions.

Along much of its length, the channel is bordered by relict point bar terrain, indicating that channel changes occurred relatively rapidly. A relict natural levee is present on the north side of the channel, through a long arc from Heafer to, roughly, the intersection of Arkansas Highway 42 with Interstate Highway I-55. This natural levee contains site 3CT50. At and near the site, Big Creek lies near the base of the natural levee, between low, dredge spoil banks. The levee crest is two meters higher than the natural bottomland of the filled Big Creek-Mississippi River channel (Figure I-4).

The sinuous channel of Little Cypress Bayou enters Big Creek from the north. This stream drains the flank of a higher relict natural levee to the north (see below), and must have cut through a low place in the Big Creek-Mississippi River natural levee (possibly a former crevasse channel) to reach Big Creek. Saucier (1974, Deckerville Plate; Figure I-2, this report) mapped an abandoned channel of the Big Creek-Mississippi River in the swale between these two natural levees.

Tyronza-Mississippi River Meander Belt

At its western end, Big Creek joins the Tyronza River, which occupies portions of the channel of a later abandoned Mississippi River course (see Figure I-2). This course has obliterated the westward continuation of the Big Creek-Mississippi River meander belt. Relict natural levees are generally poorly-defined, and occur only on the western side of this course. Ridge and swale terrain with more than one meter of relief borders most of the channel. A well-defined, flat-floored, cut-off meander which extends north to east of Earle, Arkansas, could have been associated with either the Tyronza-Mississippi, or the Big Creek-Mississippi phases.

On its western side, the Tyronza-Mississippi meander belt is bordered by the gently irregular topography of the lowest level of Saucier's (1974, Plate 1) Stream Terrace 2. This "terrace" lies

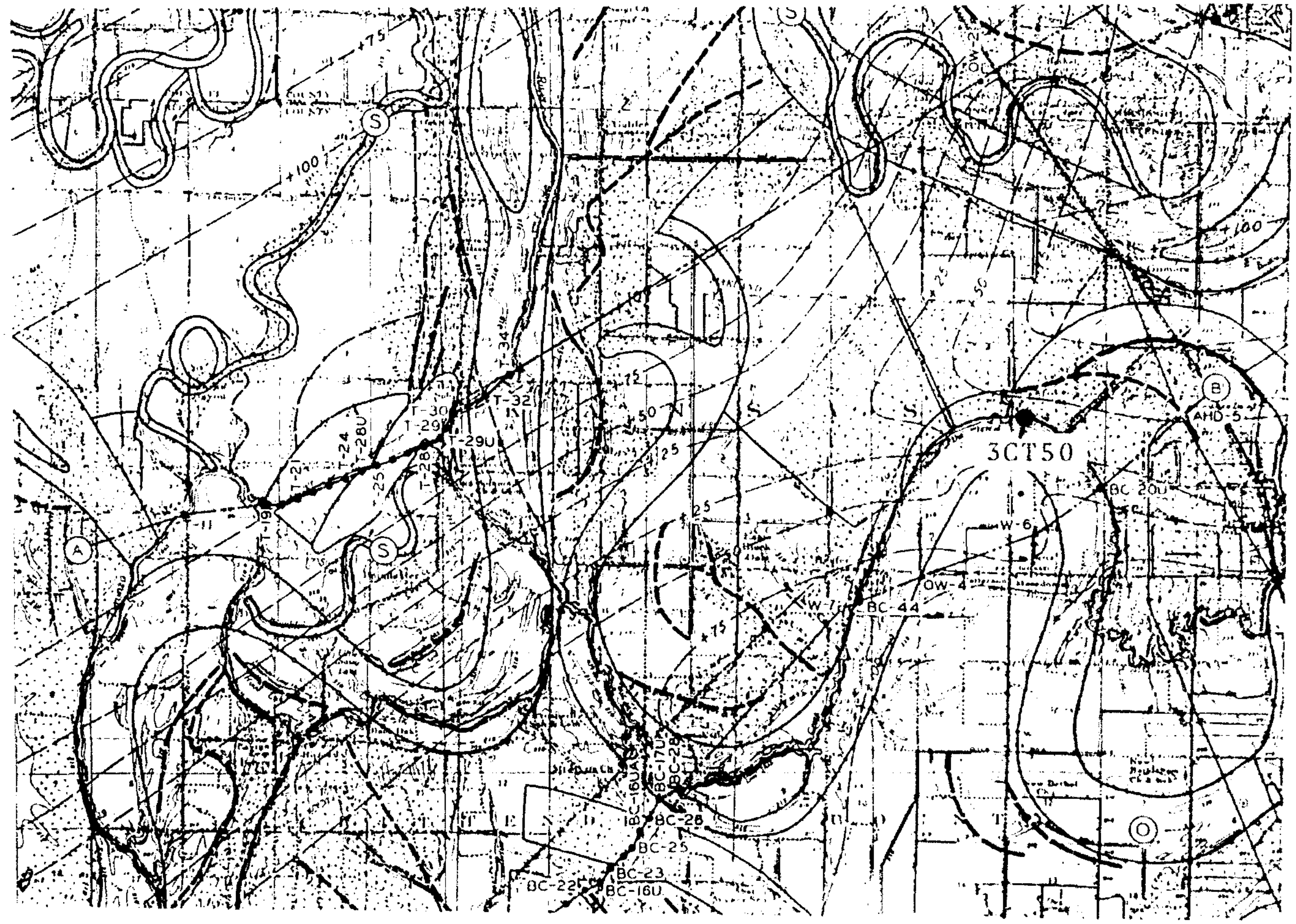

FIGURE I-2. DISTRIBUTION OF ALLUVIAL DEPOSITS AT AND AROUND SITE 3CT50 (After Saucier 1964, Deckerville Plate).

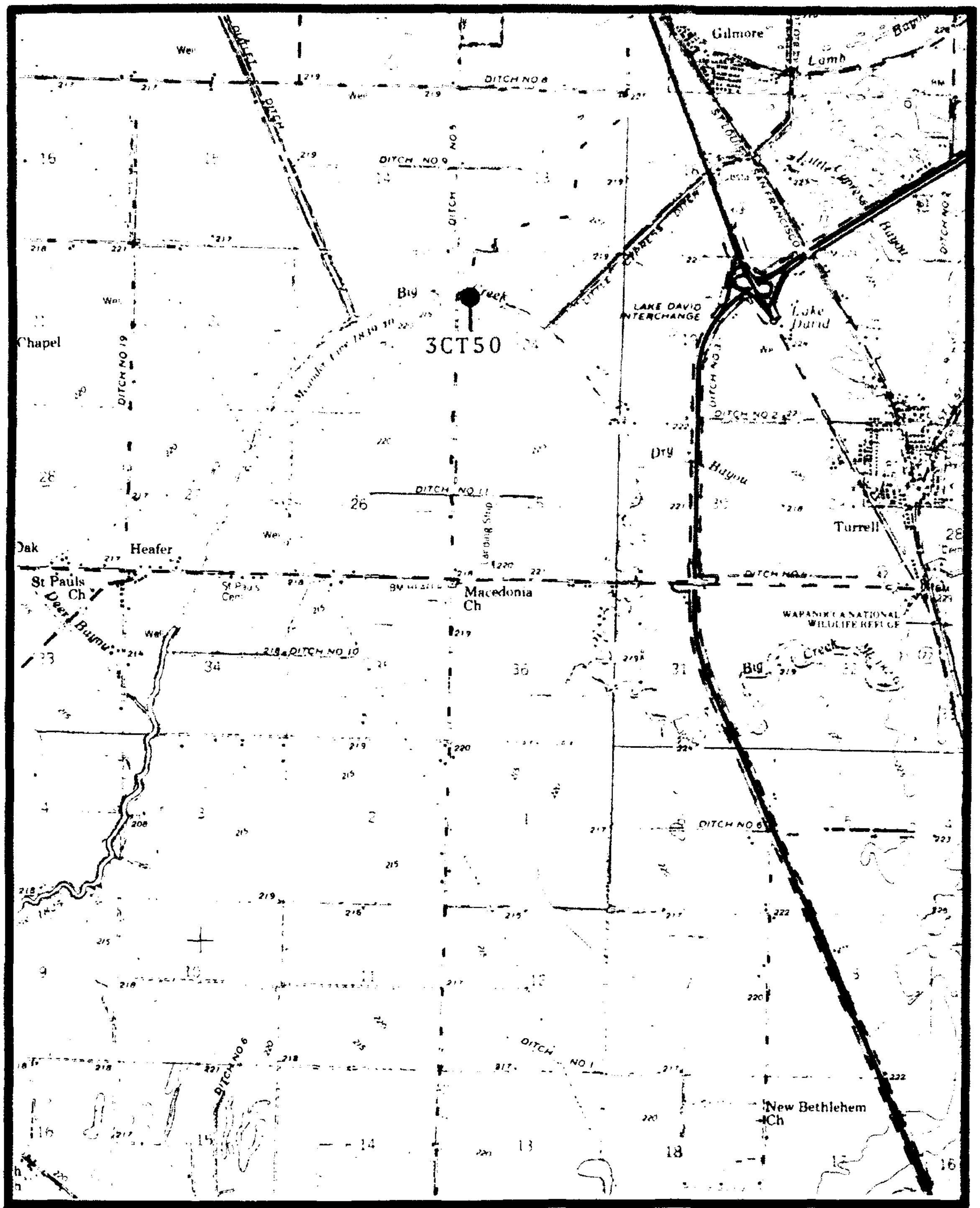

FIGURE I-3. TOPOGRAPHY AT AND AROUND SITE 3CT50 (Portion of Deckerville, Arkansas 15 minute quadrangle, U.S.G.S., 1977).

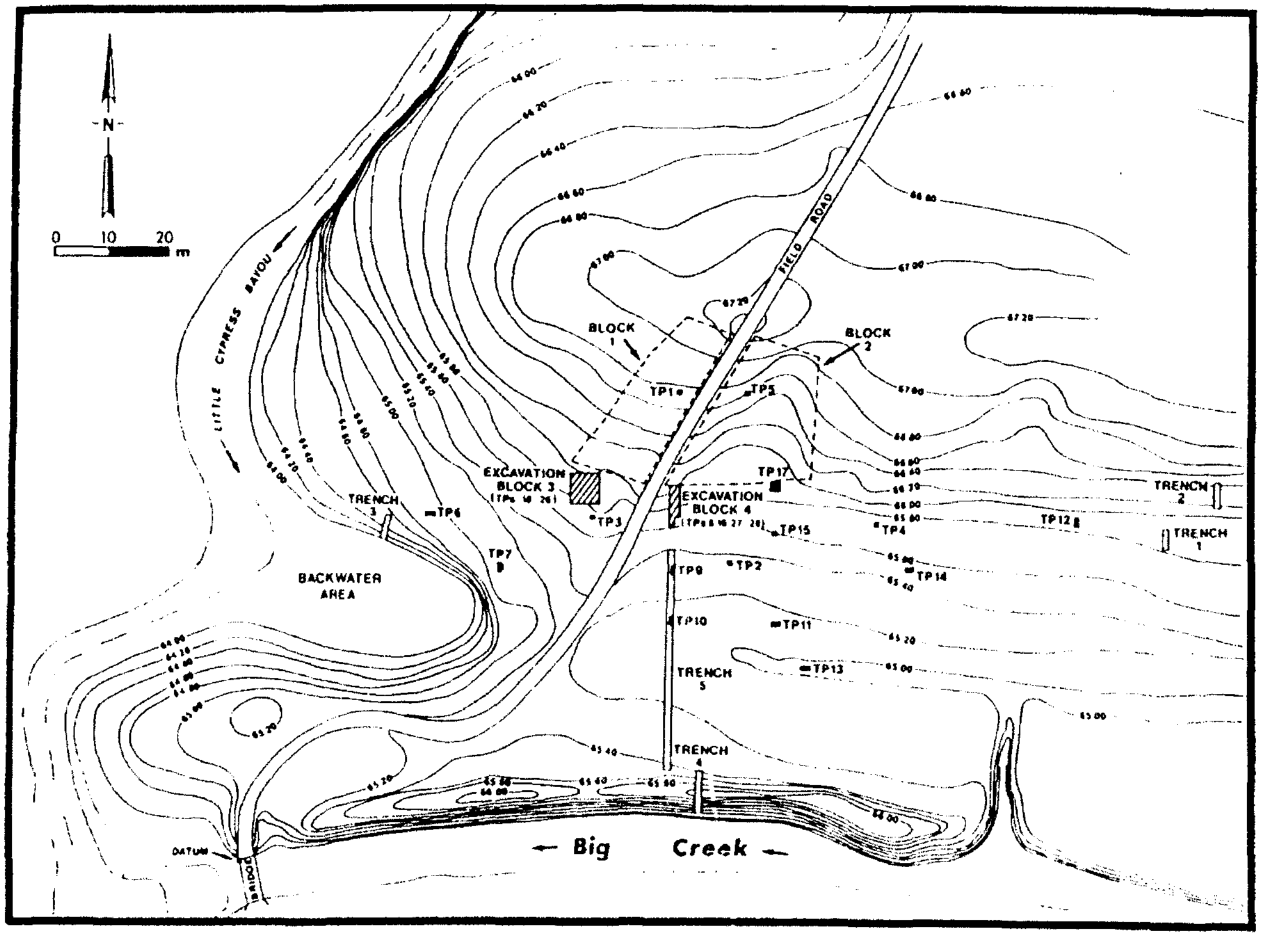

FIGURE I-4. CONTOUR MAP OF THE LITTLE CYPRESS BAYOU SITE (3CT50), CRITTENDEN COUNTY, ARKANSAS SHOWING THE DIFFERENCES IN ELEVATION.

between the south-southwest-trending Tyronza-Mississippi meander belt and Crowley's Ridge, which rises from the floodplain approximately 30 km west of 3CT50. It is rather the negative of a terrace, as its elevations range from one to three meters below those of the adjacent meander belt. No topographic evidence of a braided surface remains, probably because it has been strongly modified and buried by the meandering Saint Francis River and its tributaries. Sediment cover has also been supplied by overbank floods of the Mississippi River. The Saint Francis River enters the Tyronza-Mississippi River meander belt approximately 21 km west of 3CT50. It has constructed its own complex meander belt within the much larger relict Mississippi River meander belt.

Approximately four kilometers north of 3CT50 on its relict natural levee, Dead Timber Lake (an abandoned course of the Tyronza River) and Lamb Bayou mark a portion of the last channel of the Tyronza-Mississippi. The natural levee along the south side of this channel stands 1.5 m to two meters higher than the one at 3CT50. A shallow swale, which contains Little Cypress Bayou, separates the two levees.

Present Meander Belt

The eastern terminus of Big Creek is Wapanocca Lake, a nearly-filled oxbow lake on the western side of the present Mississippi River meander belt. Similarly, the eastern terminus of the Big Creek-Mississippi meander belt is the cutbank of the Wapanocca Lake abandoned channel. The surface of the filled and buried Big Creek-Mississippi channel stands some three meters higher than the bottomland around Wapanocca Lake.

Summary

Three Mississippi River meander belts are defined by the geomorphic features around 3CT50. Their relative ages are defined by cross-cutting relationships, supported by estimates of amounts of slope degradation and burial. The Big Creek-Mississippi meander belt is the oldest. It includes three meander loops, and an inferred abandoned channel. Saucier (1964, Deckerville Plate; Figure I-2, this report) mapped the western end of this channel less than 300 m north of 3CT50. However, there is no evidence of it in the topography of the Big Creek-Mississippi natural levee. It was probably filled and buried during the active phase of the Big Creek-Mississippi course.

The next oldest meander belt is that of the Tyronza-Mississippi River. It has removed the westward extension of the Big Creek-Mississippi River course. In addition, the relief of relict ridge and swale terrain is less subdued in the Tyronza-Mississippi meander belt (see Figure I-3). These two locally-named meander belts are part of Saucier's (1974) Mississippi River meander belt number 3 (see Figure I-1), possibly active between 6000 and 4600 years ago.

The present meander belt has been continuously occupied (although with a constantly and rapidly changing course) since abandonment of

the Tyronza-Mississippi meander belt. It therefore includes both phases 4 and 5 in Saucier's (1974) chronology. The dates assigned by Saucier for the beginnings and ends of the various phases remain, regrettably, very tentative.

SOILS AND STRATA AT 3CT50

Soil Types

Gray and Ferguson (1974) mapped the soils of the relict Big Creek-Mississippi meander belt at and around 3CT50 as Sharkey and Tunica types. The Big Creek channel and adjacent bottomland contains very poorly-drained Sharkey silty clay (zero to one percent slopes). The relict natural levee crest east of Little Cypress Bayou is Sharkey silty clay (gently undulating). In contrast, the relict natural levee crest west of the bayou was mapped as Tunica clay (frequently flooded).

Sharkey and Tunica soils both form in thick sections of poorly-drained Mississippi River alluvial clay; the difference is that the Tunica soils form in clay beds which overlie coarser (silt and/or sand) deposits (Gray and Ferguson 1974:20). This distribution, on opposite sides of the bayou, indicates that the original deposits of the Big Creek-Mississippi natural levee were coarser west of the bayou. A levee-top sand bar, formed by a major Big Creek-Mississippi flood, could underlie the clays with the Tunica soil. Such a sand deposit would have been buried by a thinner section of clay during the prehistoric occupations, and might have caused a difference in vegetation communities across the bayou.

Stratification and Sediments

Introduction

Data from the backhoe trenches, supported and extended by stratigraphic sections from the archaeologists' pits, is summarized in Table I-2 and in various figures in this section. A useful division

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TABLE I-2. SUMMARY OF NATURAL STRATIGRAPHY AT 3CT50.

Site Stratigraphic Summary

Stratum Ip	=	plow zone
I	=	post prehistoric occupation Big Creek alluvium
II	=	buried A horizon and prehistoric midden
III	=	pre-occupation Big Creek alluvium
IV	=	buried A horizon - theoretically non-cultural
V	=	Mississippi River post abandonment oxbow lake deposits
VI	=	Mississippi River active meander deposits
VII	=	Mississippi River meander levee deposits

in this section is the description of the Big Creek stratigraphic section in two parts: 1) the filled channel area below +65.8 m (site datum) at the road, and +66.0 m at the eastern end of the site area; and 2) the natural levee slope above +65.8 m to 66.0 m (site datum) (see Figure I-4). The former comprises very gentle slopes around a shallow, east/west trending trough, and the latter is a gently irregular surface which rises northward at triple the gradient of the channel area.

The geologic section and strata on the Little Cypress Bayou side of the site are described separately for two reasons. The deposits are texturally different, and the transition between the bayou-side section and the creek-side section lies beneath the road and adjacent disturbed ground (Figure I-5). Consequently, correlation of the stratum below the midden is only tentative.

Stratum Ip: This layer includes the historic plow zone which overlies the site (Figure I-6). It is comprised of post-occupation clay and silt in the lower lying areas of the site. On the relic levee, cultivation has incorporated both prehistoric midden (Stratum II) and coarse-grained levee deposits into the plow zone. Where the underlying midden has been disturbed by plowing, prehistoric artifacts abound on the surface and within Stratum Ip. The depth of this layer varies but is generally between 10 cm and 30 cm thick.

Stratum I: This deposit is comprised of post-occupation alluvium from Big Creek and Little Cypress Bayou overflow. It is confined to the trough-like area between Big Creek and the base of the relic meander levee. Prehistoric artifacts contained within this layer are few in number and probably the result of disturbance. Stratum I ranges between 20 cm to 75 cm in thickness.

Big Creek Section: Filled Channel: Below Stratum I in this portion of the site (see Figure I-5) is the midden soil and its sterile equivalent, which comprise Stratum II. This dark gray to dark grayish brown silty clay loam is a buried, partly anthropogenic soil zone. It ranges from zero to some 40 cm in thickness. The layer marks an irregular surface (Figures I-7 and I-8), where it is intermittent; it forms lenticular, concave-upward drapes across the bases of what might have been backswamp slough channels. Disruption of this horizon by post-occupation tree throw is evident in the profiles for Test Pit 8 and another type of disruption - seismic event stratification - is apparently present in Test Pit 15 (Figure I-9).

The irregular thickness and elevations of Stratum II are caused by protrusions and depressions in the upper boundary of the stratigraphically underlying Stratum III. This culturally sterile silty clay loam to silty clay is mottled in various yellowish brown to brown colors. The boundary between the two has much less relief than the upper boundary of Stratum III.

Stratum IV ranges in thickness between 15 cm and 50 cm, and maintains a relatively constant elevation in the southern three-fifths of

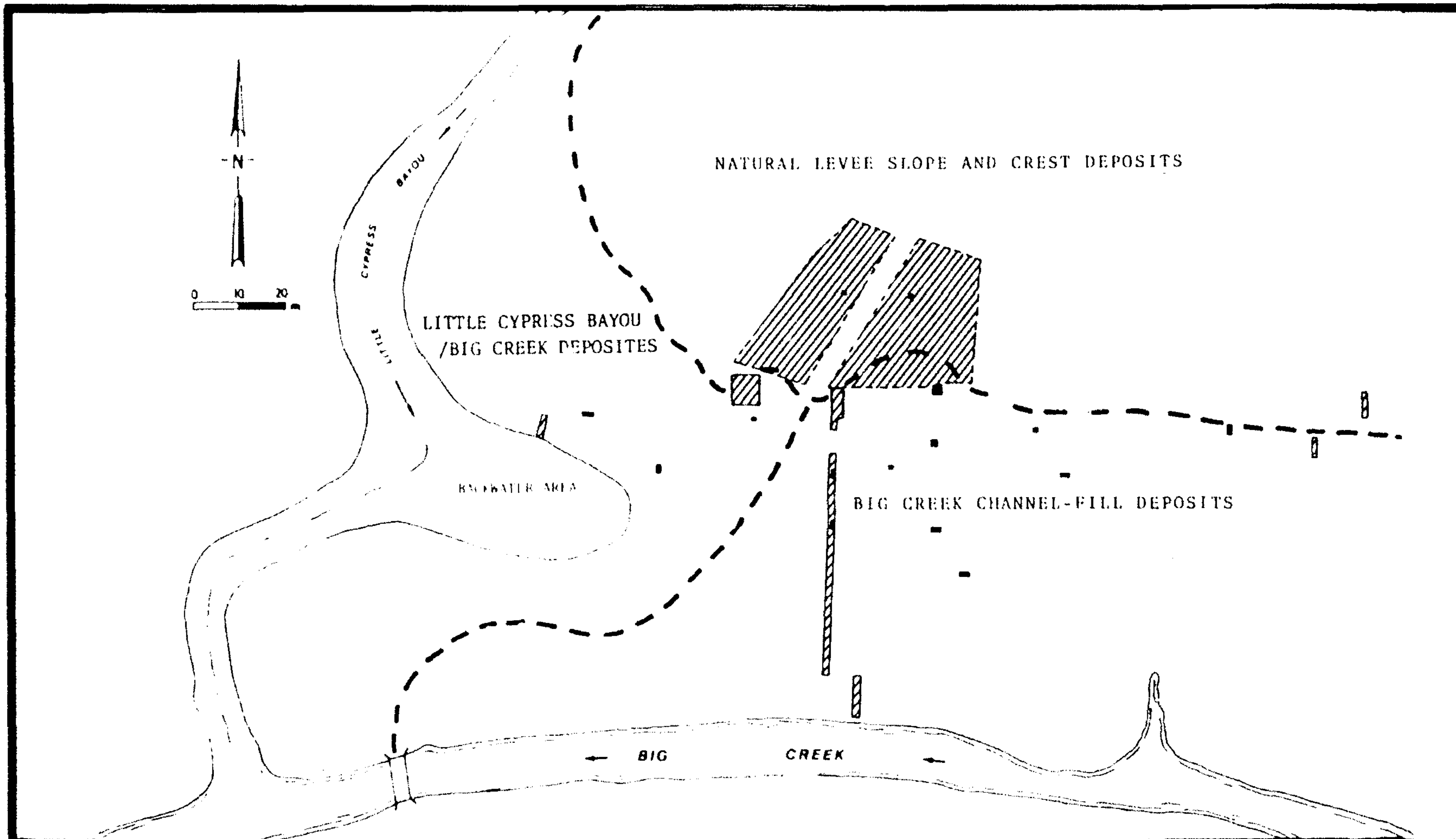

FIGURE I-5. MAJOR SOIL DIVISIONS DISCUSSED IN TEXT.

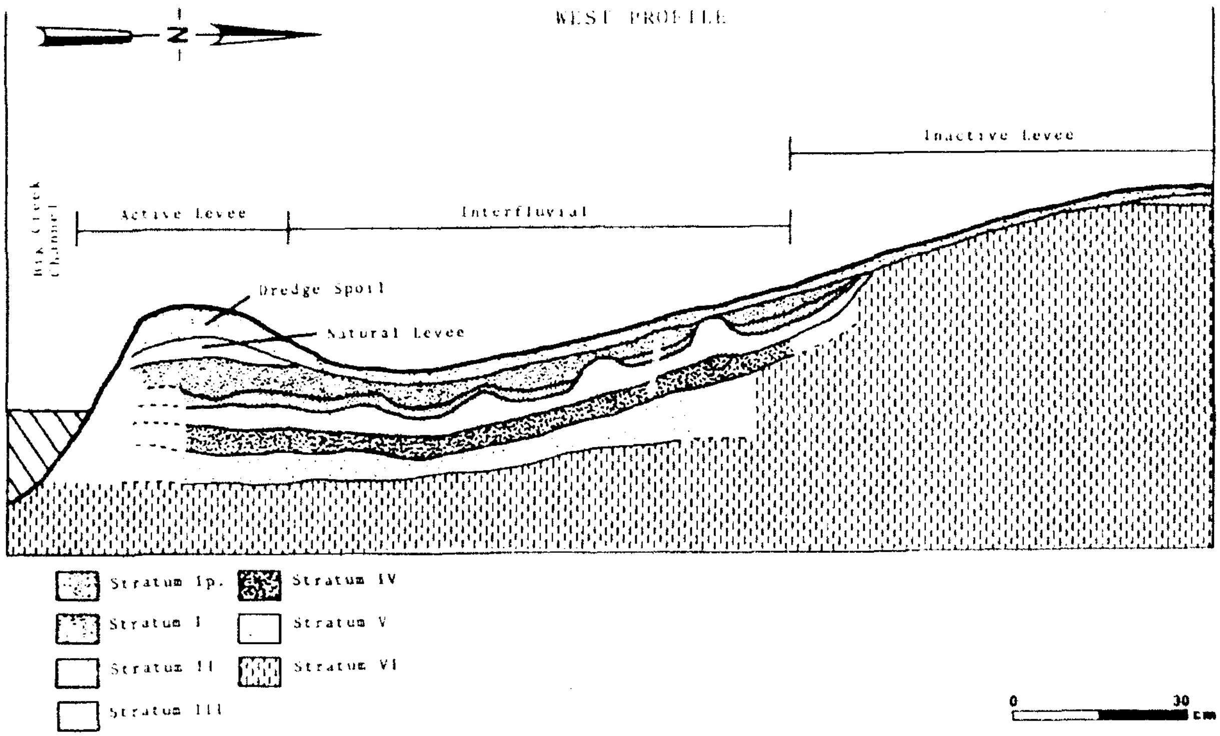

FIGURE I-6. SCHEMATIC STRATIGRAPHIC CROSS-SECTION OF THE LITTLE CYPRESS BAYOU SITE.

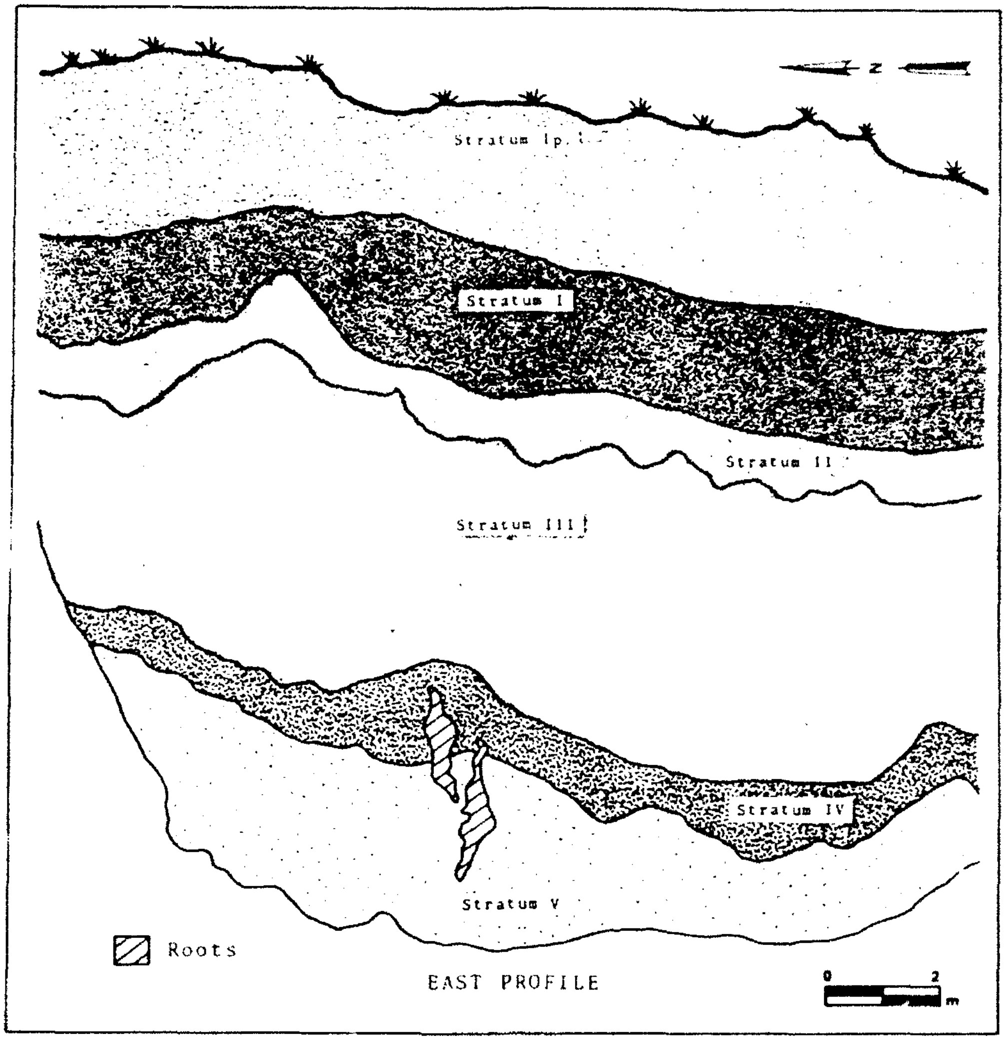

FIGURE I-7. EAST PROFILE, BACKHOE TRENCH 4.

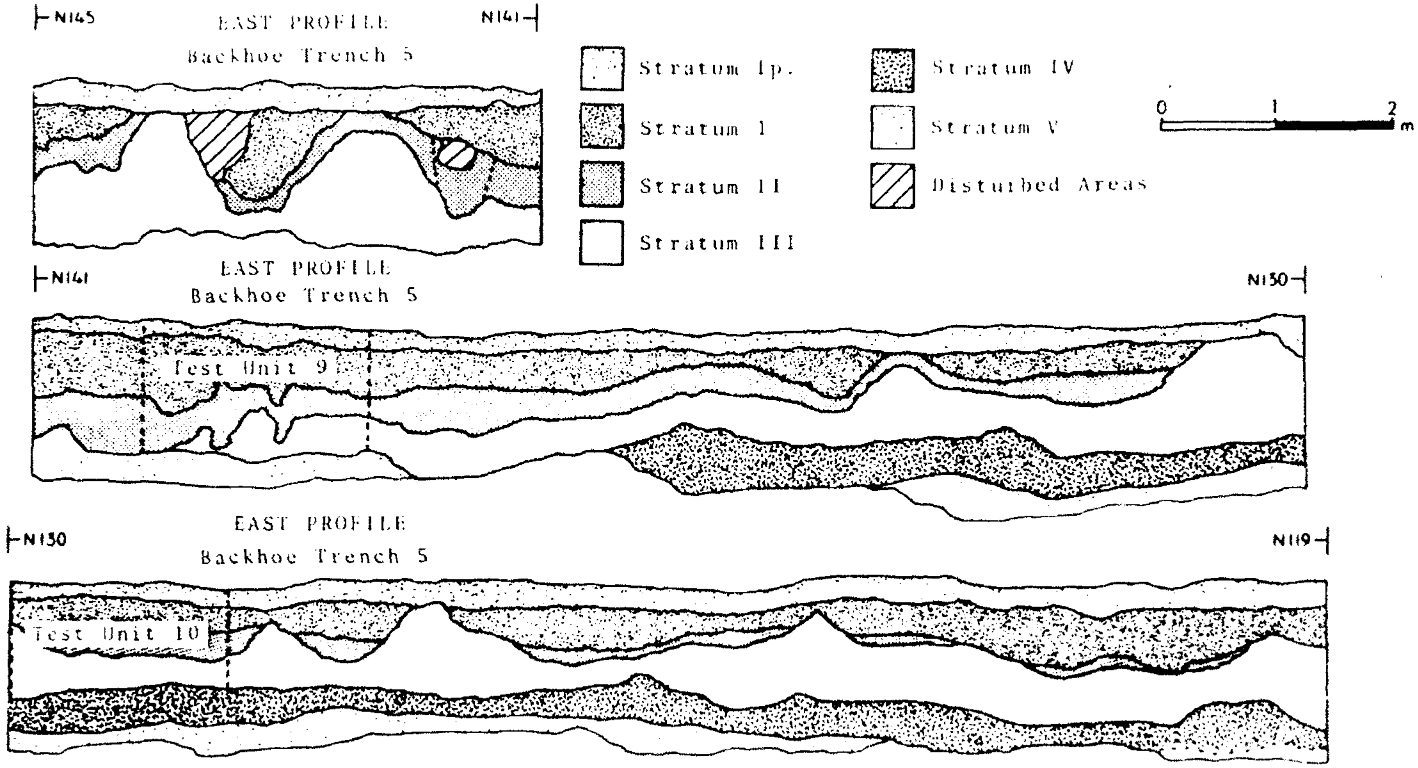

FIGURE I-8. SOIL PROFILE OF BACKHOE TRENCH 5.

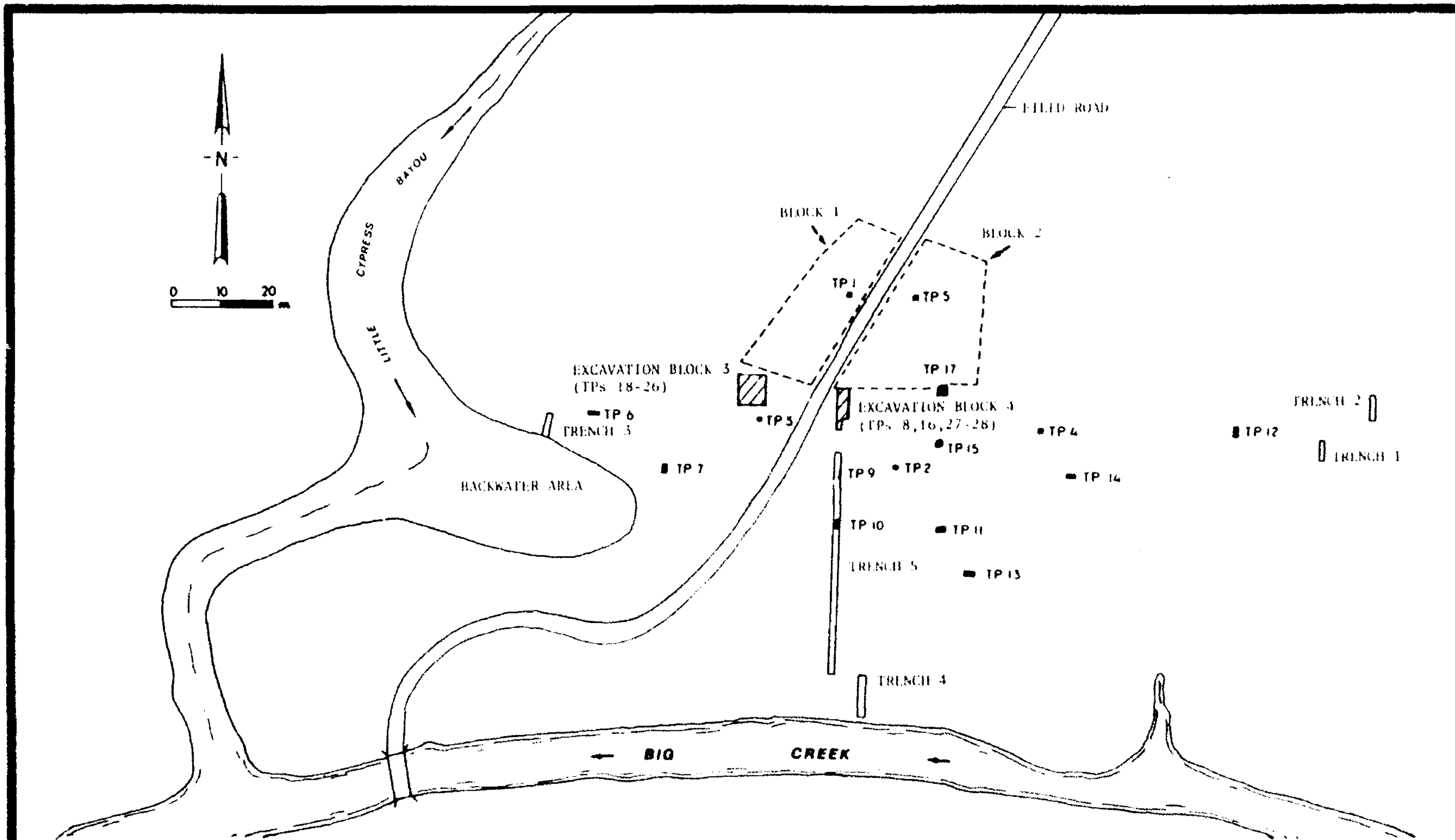

FIGURE I-9. LOCATION OF EXCAVATION UNITS AND BACKHOE TRENCHES AT 3CT50.

Trench 5. In the northern two-fifths of this trench, the layer dips below the base of trench. Underlying Stratum IV is a mottled brown/yellowish-brown silty clay, Stratum V. Carbonate nodules are abundant in this horizon, and a few also scattered through Stratum IV.

Big Creek Section: Natural Levee Slope: Trenches 1 and 2 were cut in sterile soils at the eastern margin of the study area to expose the natural stratification of the lower natural levee slope and the transition to the filled channel. Test Pit 4 (Figure I-10) was dug deeply into sterile material below the Stratum II midden for the same purpose. In all three of these locations Strata I and II were readily identified. In the trenches, Stratum II is a gray to grayish brown, culturally sterile silty clay. Test Pit 4 and Trench 2 contain underlying layers (Strata III through V) similar to those of the filled channel area. However, in Trench 1, Stratum II appears to be missing, and Stratum III lies directly on what is probably Stratum IV, the older "A" horizon. This trench was cut to a depth of 2.5 m below ground surface, exposing a downward transition from Stratum IV (?) to a coarsely mottled sandy silt with carbonate nodules, Stratum VI. This material is an upper point bar/lower natural levee deposit.

To the west, in Excavation Blocks 3 and 4 (Figure I-11), Stratum I through III taper out on the rising south slope of the relic levee. In Blocks 1 and 2 Stratum VII directly underlies Stratum Ip except where isolated pockets of Stratum II midden occur in the northern end of Block 1. It is likely that at one time Stratum II extended from the base of the levee, where it is present in Blocks 3 and 4, and was a continuous deposit up to the levee crest. Plow disturbance and erosion have removed most of this stratum, or incorporated it into Stratum Ip.

Little Cypress Bayou Section: Stratum I in this area is silt loam to silty clay loam deposited by Little Cypress Bayou, with an admixture of clays from Big Creek overbank flooding. Close to the creek, it contains several silt layers (Figure I-12). In Trench 3, two of these lenses mark the base and top of the Stratum II equivalent which contains prehistoric artifacts and has a high organic content. One silt layer lies within Stratum II in this trench; therefore, at least three years in which flooding occurred are represented by the cultural deposit.

Below the Stratum II equivalent lie dark yellowish-brown silty clays which resemble, but cannot be definitely correlated with Strata IV and V to the east. They do represent a lower levee slope zone prior to development of the Little Cypress Bayou drainage.

Seismic Event Stratification: The profiles and plan views of Test Pit 15 (Figures I-13 and I-14) shows an interesting structure probably related to an earthquake. It is a vertically narrow, horizontally extensive, sand-filled crack which extends across part of Stratum III, through Stratum II, and into the lower portion of Stratum I. The sharp boundaries and planar form of the crack, and the sand fill

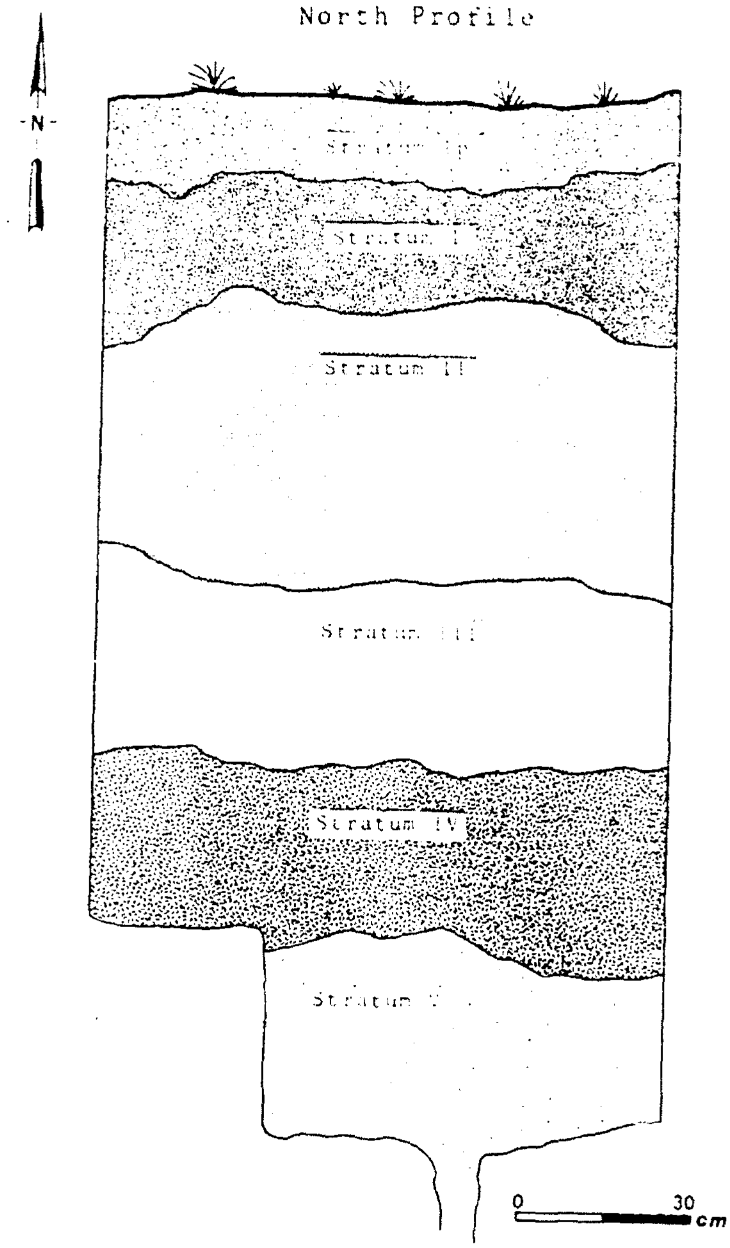

FIGURE I-10. TEST PIT 4, N148E329, NORTH VERTICAL STRATIGRAPHIC PROFILE.

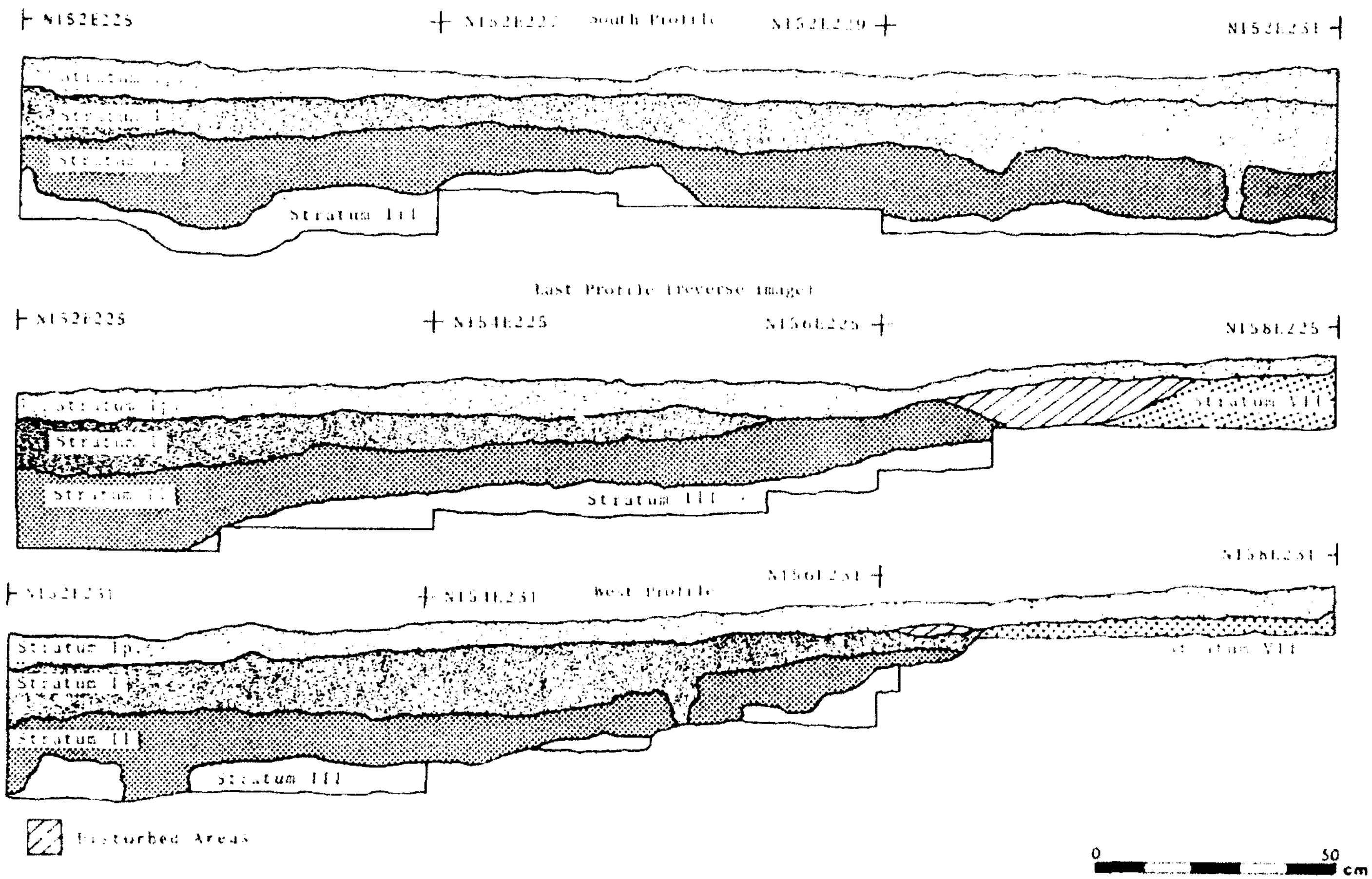

FIGURE I-11. WEST STRATIGRAPHIC PROFILE OF EXCAVATION BLOCK 3.

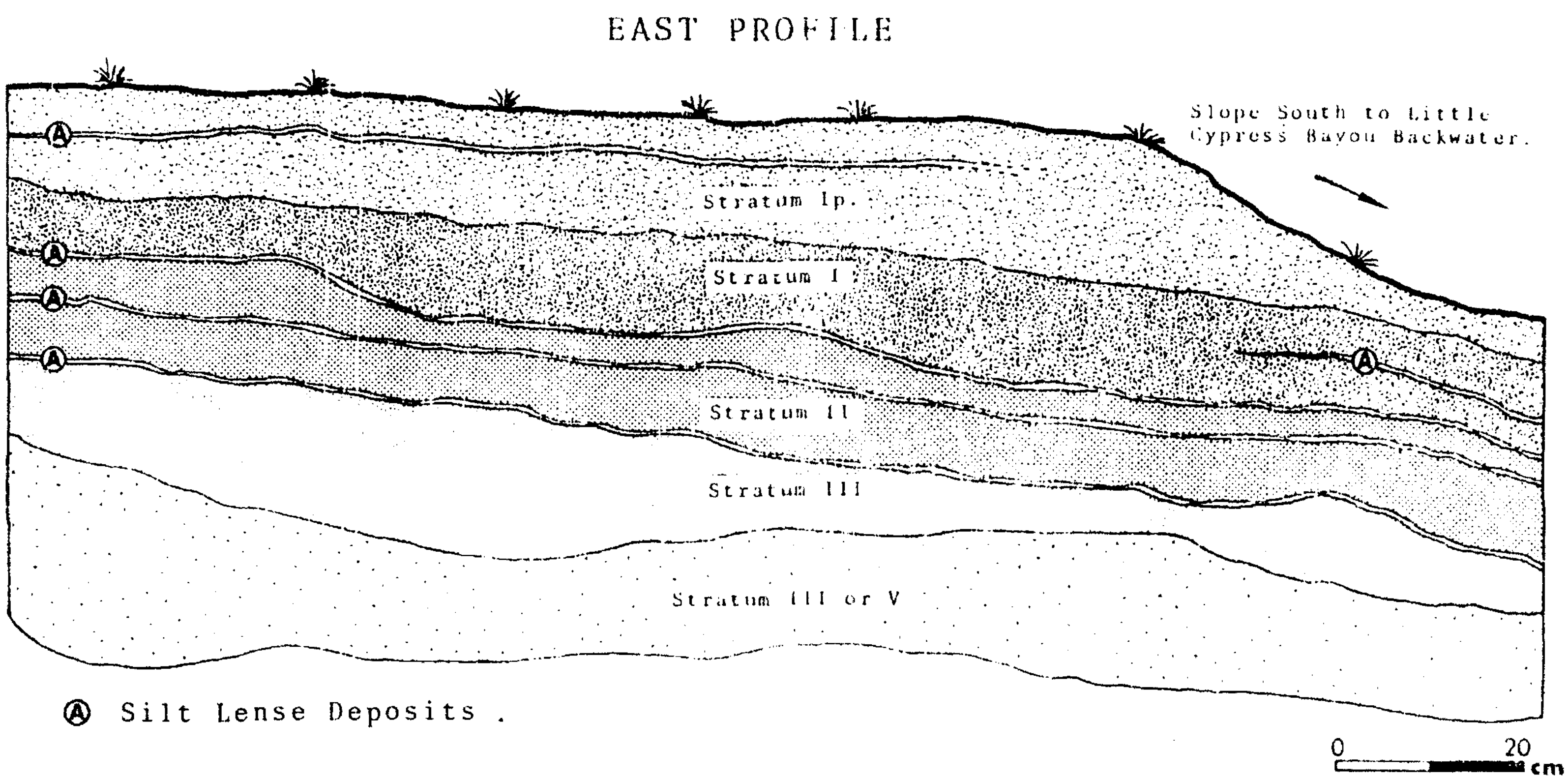

FIGURE I-12. BACKHOE TRENCH 3 SOIL PROFILE.

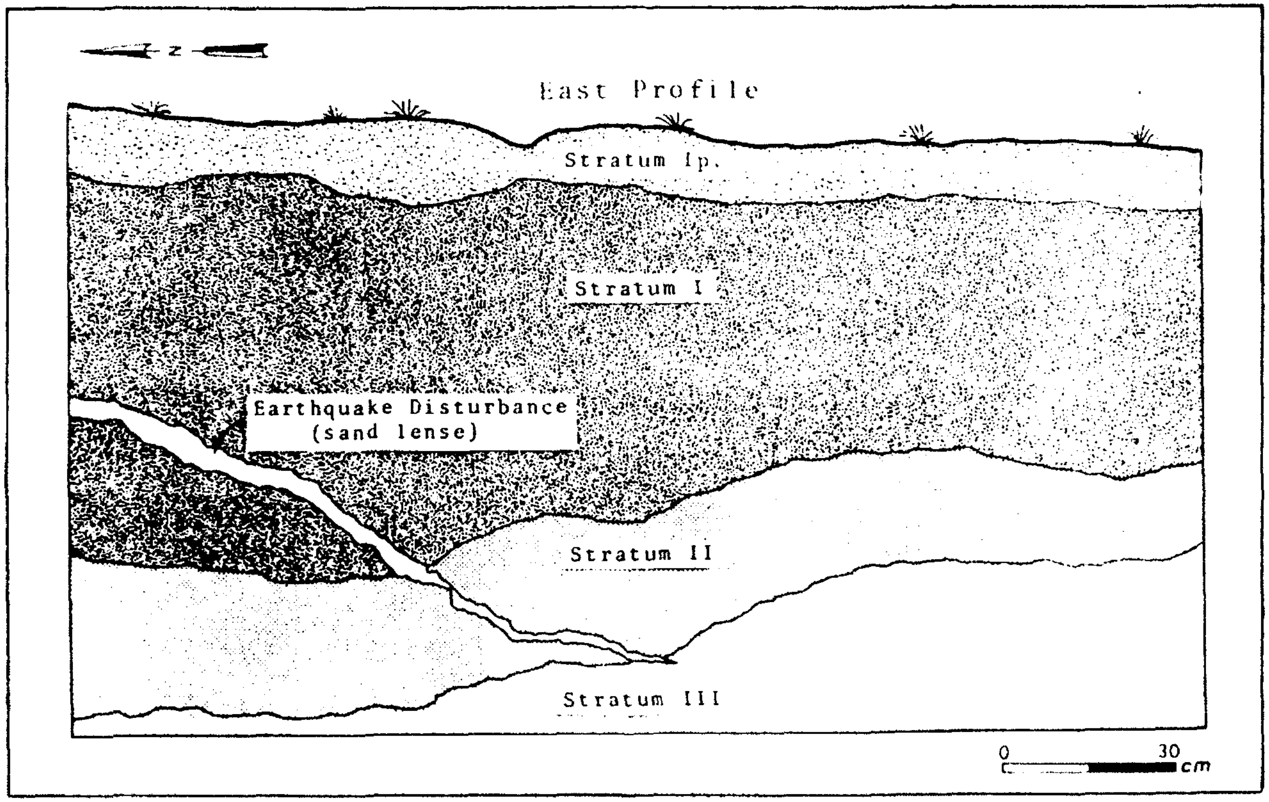

FIGURE I-13. TEST PIT 15, EAST PROFILE.

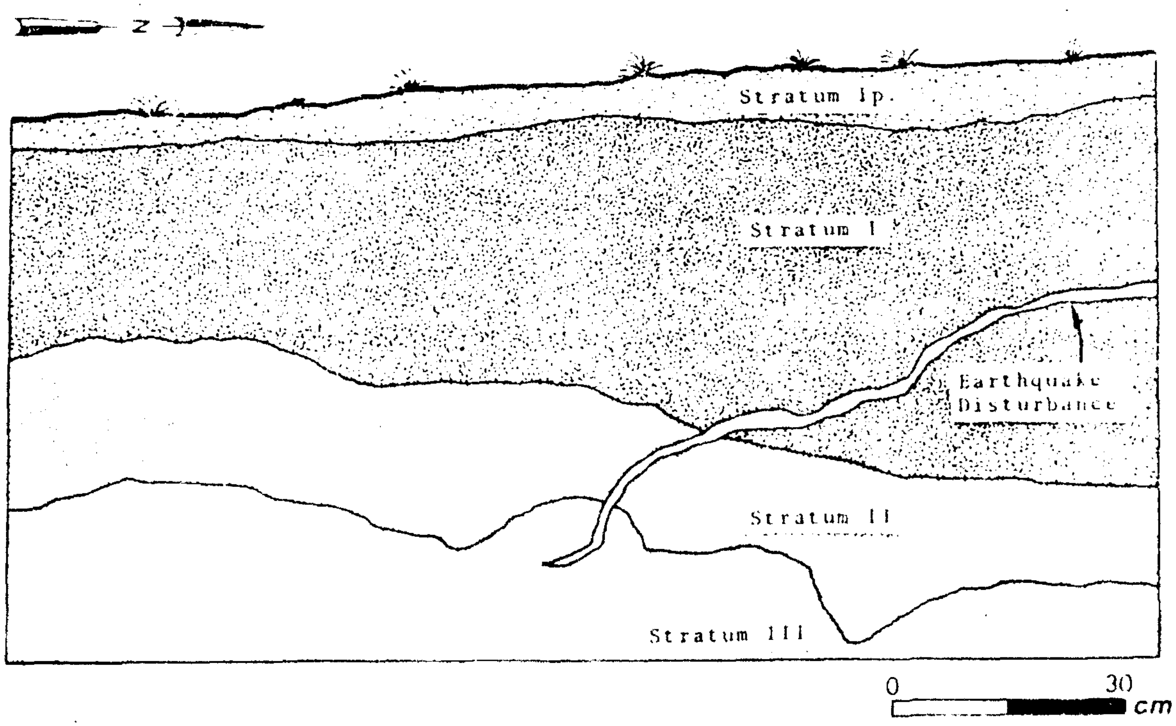

FIGURE I-14. TEST PIT 15, WEST PROFILE.

between clay layers show that it is not a burrow or root feature. Sand from a point bar or channel bar deposit which underlies the natural levee must have been suddenly mobilized and injected up the crack. No date other than post-prehistoric occupation can be definitely assigned to this event. It is probably, however, associated with the historically documented New Madrid earthquake, which occurred early in the second decade of the last century.

Summary

Several depositional events are represented by the layers at 3CT50. Unfortunately, their connection with changes in geomorphic features as close as Big Creek are largely inferences. The silty, sandy material in the lower portion of Trench 1 was deposited by the original Mississippi River meander, possibly as a levee-face bar. Strata IV and V are post-abandonment. They represent the soil which developed on the colluvium of the degraded levee slope, and on the silty clays which filled the oxbow lake in this meander. Stratum III represents an episode of increased deposition which buried the Stratum IV "A" horizon. It could be correlated with the origin of Big Creek, possibly by development of a crevasse through the natural levee of the Wapanocca Lake meander to the east. The irregular upper surface of Stratum III in the filled channel area apparently marks a complex of sloughs in the narrow backswamp between a Big Creek natural levee (now buried below the spoil bank) and the relict Mississippi River natural levee.

Stratum II, partially anthropogenic, is another fossil "A" horizon. On the Big Creek side, it floors low areas in the Stratum III surface, and extends partway up the natural levee slope. Historic plowing has apparently obliterated the true extent of this horizon. On the Little Cypress Bayou side, the cultural deposit coincides with a textural change from Mississippi River-type backswamp clay to Little Cypress Bayou silty clay and silt. Either the origin of the Little Cypress Bayou drainage was much later than the postulated crevasse from the Tyronza-Mississippi course to the north (see above), or Little Cypress Bayou has been able to migrate slightly, eroding its bank material, then building a new bank at the same location. The data show only that the initial or a later phase of deposition by Little Cypress Bayou included cultural material (including organic detritus) from some portion of the prehistoric occupation of 3CT50.

Stratum I possibly represents a period of deposition rapid enough to bury the Stratum II "A" horizon. Alternately, the human-caused changes to the landscape and soil might have produced Stratum II as a local horizon in a relatively constant depositional environment which produced Strata I and III. From the limited stratigraphic data at this one site, it is not possible to differentiate the effects of a climatic and/or hydrologic cause of human settlement, from a human settlement cause of soil and sediment changes.

Apart from tree throw disturbances and historic plowing, the layers show one interesting event. At some time after prehistoric

abandonment of the site, an earthquake opened at least one crack into which a sheet of sand from the underlying Mississippi River deposit was thrust.

DISCUSSION AND CONCLUSIONS

Geomorphic History

The earliest land surface in the vicinity of 3CT50 is a braided Mississippi River floodplain between the Tyronza River and Crowley's Ridge. This surface has been buried by clays which settled from overbank floodwaters of the meandering Mississippi and Saint Francis rivers. The braided phase of the Mississippi and Ohio rivers in the Saint Francis Basin might have ended approximately 6000 years ago, when both shifted rapidly to meandering forms, and joined at the northern end of the basin.

The Big Creek-Mississippi River meander belt is the next oldest feature. River flow was probably from east to west. Its eastern and western extensions have been removed by later courses of the river. The well-formed meanders represent the last course of the river in this meander belt. One possible cut-off meander lies just north of 3CT50; however, it would have been completely buried by the time of the recorded prehistoric occupations.

Big Creek probably represents an active drainage stream which developed at some time after filling of oxbow lakes in the abandoned Big Creek-Mississippi River course. As oxbow lakes fill, they preserve the relatively straight to gently-curved form of the original channel. One example, Swan Lake, in the Upper Steele Bayou Basin of Mississippi, persisted through perhaps 1500 years, according to the archaeological evidence (Gagliano and Weinstein 1979:4-10). Big Creek might have developed after a crevasse opened in the natural levee of the Wapanocca Lake meander to the east, in the present Mississippi River meander belt.

The channel of Little Cypress Bayou through the natural levee at 3CT50 probably also marks a former crevasse. Flow in the bayou channel increased when the higher natural levee to the north was constructed, apparently shortly after abandonment of the Big Creek segment. Although there are no absolute dates for the active Big Creek-Mississippi meander belt, it lies within Saucier's (1974) Meander Belt Number 3 in the Saint Francis Basin, with an inferred age of perhaps 5000 years.

The Tyronza-Mississippi River meander belt is also part of Meander Belt Number 3. Initiation of Tyronza-Mississippi river flow could have caused abandonment of the Big Creek-Mississippi course. Overbank deposits from its floods gradually overlapped the terrain of the Big Creek-Mississippi meander belt.

The Tyronza-Mississippi course was apparently the last active Number 3 Meander Belt course in this part of the basin. As it was

abandoned, possibly 4600 to 4800 years ago, the Mississippi shifted eastward. The river has remained in its present meander belt (a combination of Saucier's Numbers 4 and 5) ever since. Overbank flooding has continued during that time, gradually filling and burying features of the older meander belts.

The effects of earthquakes in the New Madrid Seismic Zone are unknown, with one possible exception. An anomalous sand in the silty clay layer which covers the Big Creek-Mississippi natural levee at 3CT50, could represent a sand blow caused by a prehistoric earthquake. One of the test pits also exhibited sand filled earthquake cracks (see preceding discussions).

Archaeologic Questions

Buried Site Potential: In the present study area, limited approximately to the anticipated area of disturbance by bridge construction, there are probably no significant undetected prehistoric occupation surfaces. One major event, the construction of a natural levee by the Mississippi River in its adjacent channel, is recorded in the stratification. The soil zones which developed after the river abandoned this course have been detected and explored to varying extents.

On the broader question of what diagnostic changes occur in cultural features buried at elevations continually below the water table, 3CT50 offers no answer.

Big Creek: Stratum III is inferred to be the primary deposit of Big Creek after filling of the oxbow lake. Its thickness indicates that the creek had probably been in position long before the prehistoric occupation. As described above, Big Creek meanders where it crosses sandy ridge and swale deposits, and maintains a straight, or gently curved course through relict channel areas. The Mississippi River floodplain contains many examples of features which form a spectrum from formation of an oxbow lake after a meander is cutoff, through filling of the lake while maintaining shorelines parallel to the former backswamp stream which preserves the form of the old channel. Big Creek has probably been in its present location at Site 3CT50 throughout the latter's history.

Little Cypress Bayou: The relationship of Little Cypress Bayou to the prehistoric occupation is the most interesting question, and the most intractable. The change from clay to silt loam at the base of Stratum II at the bayou, and the silt layers at the base and top of the cultural deposit open several questions. Did development of bayou drainage into Big Creek, through an old crevasse swale, provide the environment that quickly attracted the aborigines? Were the Baytown people occupying the site when the drainage developed, and the combination of bayou and creek flooding discouraged them? Or did the bayou erode bank material it had laid down prior to or during the early part of the prehistoric occupation, then deposit more which included the cultural material as Stratum II. The answer is probably buried under the present road.

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APPENDIX II

FAUNAL REMAINS FROM THE LITTLE CYPRESS BAYOU SITE (3CT50), CRITTENDEN COUNTY, ARKANSAS

by
Arthur E. Bogan

Analysis of animal remains recovered from archaeological excavations on the Little Cypress Bayou site focussed on a collection of approximately 23,000 pieces of bone, 770 grams of indeterminate mammal bone and 554 mollusks.

Methodology

Faunal remains were recovered in 1/4 inch mesh screens and by flotation. The overall size of the recovered animal debris was small (usually less than one centimeter maximum dimension). The total faunal sample, composed of very small fragments, represented a tremendous task; consequently, it was decided that the most prudent approach to the large quantity of material was to analyze a subset of the total sample.

Feature 351 was chosen and the west half was separated into 50, 25, 25, 15, and 10 percent samples and completely analyzed. Species diversity for both vertebrate and mollusks were plotted as a cumulative graph on the five samples from smallest to largest. It was obvious from the graph that a 25 percent sample would yield about 90 percent of the species diversity in a feature. After counting about 6600 indeterminate mammal bone fragments, it was decided that this fraction of the sample would be weighed to the nearest gram and reported only as a weight.

Twenty-five percent of each feature was identified, the indeterminate mammal bone weighed and recorded. The remaining 75 percent of the faunal sample from the feature was carefully scanned for overlooked taxa. All of the basic identifications are presented in this appendix and are summarized in Table II-1 by provenience. The table has been ordered by cultural period, and begins with those features assigned to the Baytown period on the basis of either absolute dates or ceramic associations. As discussed in the interpretations (Chapter Five, Volume I), radiocarbon dates and affiliations suggested by certain of the ceramic assemblage indicated occupations at this site continued in a time frame usually reserved for Mississippian components. An important consideration here (and in all data analyses) was the degree to which material, structural and subsistence remains displayed variation that could augment absolute dates in distinguishing Baytown from Mississippian at this site.

In many respects, the absolute dates were the only factor in making this distinction. This led NWR to suggest an occupation marked by continuity from Baytown into Early Mississippian, the temporal differences notwithstanding. In this chapter we will explore that issue in more detail for the faunal collection. Features which could not be assigned to a temporal period are listed at the end of the table under the heading Features With Undetermined Cultural Affiliation.

As will be noted, the table also contains some abbreviations. These are: UNMB, unidentified mammal bone; UNBB, unidentified bird bone; and UNFB, unidentified fish bone.

Results

Mammals

An examination of the distribution of elements of the primary mammal food species can be quite helpful in understanding breakage patterns, refuse discard or distribution of the various meatier portions of a food animal. The deer, rabbit, and squirrel remains from different cultural periods represented have been tabulated by element (Tables II-2, II-3, and II-4). These are discussed in the following sections, followed by a consideration of other faunal species in the 3CT50 collection.

Deer: Deer elements (Table II-2) were primarily isolated teeth, antler fragments and foot elements. First it is interesting that the only complete deer elements were carpals, tarsals and phalanges. The major long bones were represented by proximal and distal portions. Comparing the body parts represented by identified pieces, there is an over-representation of skull parts and pieces and lower leg elements versus the meatier sections of the body legs. The Baytown deer sample is comprised of 39.2 percent distal leg elements and foot bones; 50.97 percent are skull fragments, which constitute 90 percent of the Baytown deer elements. This figure is very skewed even if the antler is removed from the sample (i.e., 68.6 percent are head and feet).

TABLE II-1. LISTING OF FAUNAL REMAINS BY CULTURAL PERIOD.

FEATURE	PROVENIENCE	FAUNAL REMAINS
Baytown Cultural Affiliation		
27		< 1 gm UNMB 4 fish vertebrae 7 fish scales 8 UNFB
28	Segment A	< 3 gm UNMB Squirrel - 1 distal humerus 1 incisor (B) 2 molars 1 astragalus 3 UNBB 1 fish vertebra 2 UNFB
28	General	3 UNMB Squirrel - 1 astragalus 2 UNBB 2 fish vertebrae Bowfin - 1 vertebra Centrarchid - 1 post temporal 1 fish scale
29	General	3 gm UNMB Squirrel - 1 left calcaneum 1 astragalus 2 UNBB Turtle - 2 fragments Snake - 1 vertebra Bowfin - 1 skull fragment 2 tooth patches 1 subocular 1 vertebra Channel Catfish - 1 maxilla 1 pectoral spine fragment Catfish-Bullhead? - 1 left pectoral 31 fish vertebrae 72 UNFB 11 fish scales
29	Level A	1 gm UNMB Squirrel - 3 cheek teeth 1 distal tibia 1 UNBB Gar - 1 vertebra

FEATURE	PROVENIENCE	FAUNAL REMAINS
29 (Continued)	Level A	Bowfin - 5 vertebrae
		Catfish - 1 basio-occipital
		36 UNFB
		25 fish vertebrae
		21 fish scales
50	Level 1	< 3 gm UNMB
		White-tailed deer - 1 tarsel-digested
		Squirrel - 1 left ulna
		Passerine - 1 humerus fragment
		3 UNBB
		Nonpoisonous snake - 1 vertebra
		Bowfin - 1 vertebra
		Gar - 1 scale
		< 20 UNFB
		12 fish vertebrae
		3 fish scales
		1 unionid clam
50	Level 2	< 1 gm UNMB
56	All	< 2 gm UNMB
		Squirrel - 1 tooth
		Gar - 1 scale
		Bowfin - 1 vertebra
		12 fish scales
		1 fish vertebra
		12 UNFB
		2 UNBB
59		< 1 gm UNMB
		3 UNFB
		1 fish scale
61		Turtle - 2 fragments
		Map/Painted/Slider Turtle - 1 fragment
		Bowfin - 1 vertebra
		Catfish - 1 left pectoral spine
		7 UNFB
		5 fish vertebrae
		6 fish scales
		1 indeterminate Unio
86	All	2 gm UNMB
		Deer - 1 1st phalanx fragment
		Squirrel - 1 tooth
		Catostomidae - 1 pharyngeal tooth
		1 UNBB
		Bowfin - 2 vertebra
		Drum - 1 plate fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
86 (Continued)	All	33 UNFB
		22 fish vertebrae
		< 1 gm UNMB
		2 fish scales
90	Segment A	11 gm UNMB (1 digested)
		Squirrel - 1 cheek tooth
		Muskrat - 2 right tibia shaft
		Passerine - 1 distal tibiotarsus
		3 UNBB
		Turtle - 5 fragments (1 digested)
		Kinosternid - 1 plastron fragment
		Centrarchid, cf. Lepomis - 1 vomer
		Minnow - 1 gill arch
		Drum - 3 teeth
		1 otolith
		Gar - 1 fragment
		Bowfin - 4 vertebrae
		2 fragments
		Catfish - 3 left cleithrums (small)
		2 spines - (right, left) (large, small)
		1 parietal
		78 fish vertebrae
		63 UNFB
		14 fish scales
92		< 1 gm UNMB
		1 fish vertebra
		3 UNFB
93A		< 2 gm UNMB
		Squirrel - 1 molar
		Turtle - 1 fragment
		Catfish - 1 weberian vertebrae
		Squirrel - 1 molar
		27 fish vertebrae
		1 fish scale
		5 UNFB
102	Level 1	< 1 gm UNMB
		3 fish vertebrae
		4 UNFB
		2 fish scales
102	Level 2	< 1 gm UNMB
		Squirrel - 1 molar
		1 UNBB
		Turtle - 2 fragments
		Bowfin - 1 vertebra

FEATURE	PROVENIENCE	FAUNAL REMAINS
102 (Continued)	Level 2	3 fish vertebrae 5 fish scales 1 bivalve fragment
102	Level 3	< 7 gm UNMB Gar - 1 scale Minnow - 2 gill arch 2 fish scales 5 fish vertebrae 7 UNFB
102	General	< 1 gm UNMB 1 fish vertebra 1 indeterminate land snail
168		< 1 gm UNMB
195	Strata A	< 1 gm UNMB 1 UNBB 2 fish vertebrae 2 fish scales
215		< 1 gm UNMB 1 UNFB
228		< 1 gm UNMB Turtle - 1 fragment
281		< 1 gm UNMB 1 UNBB 1 fish vertebra 2 UNFB
294		1 Viviparus? fragment 2.5 gm UNMB 4 UNBB cf. Kinosternid - 1 shell fragment Mud/Musk Turtle - 1 marginal Turtle - 2 fragments Centrarchid - 1 cleithrum 1 supraoccipital Gar - 2 scales Bowfin - 2 vertebrae Drum - 1 otolith 7 fish scales 15 fish vertebrae 22 UNFB
295	Stratum A	2 indeterminate bivalves

FEATURE	PROVENIENCE	FAUNAL REMAINS
295	Stratum B	6 gm UNMB Rabbit - 1 molar Squirrel - 1 distal tibia White-tailed deer - 1 distal metapodial (chewed) 2 UNBB Boxturtle - 1 pleural Catfish - 1 right cleithrum Bowfin - 1 vertebra 11 fish scales 37 fish vertebrae 98 UNFB
295	General	Squirrel - 1 right scapula 1 left jaw Duck - 1 right CMC Boxturtle - 4 marginal 1 margin? Channel Catfish - 1 right pectoral spine 5 large fish vertebrae 2 UNFB
299	Level A	1 gm UNMB White-tailed deer - 1 antler base with 1 tine top chopped off - antler shed Rabbit - 1 molar 4 UNBB 6 fish vertebrae 9 UNFB 1 fish scale
299	Level B	1 cf. <u>Lampsilis</u> <u>ovata</u>
299	Level C	< 1 gm UNMB 1 fish vertebra
299	Level D	< 1 gm UNMB 1 fish vertebra bivalve fragment
299	General	1 UNBB 3 indeterminate Unio < 2 gm UNMB 16 fish vertebrae 1 fish scale 11 UNFB

FEATURE	PROVENIENCE	FAUNAL REMAINS
314	Level A	Bowfin - 1 skull fragment Ictalurus - 1 scapula fragment 4 fish scales 8 fish vertebrae 16 UNFB 1 Hawaiia
314	Level B	< 1 gm UNMB Squirrel - 1 sacrum fragment 1 UNBB Hawk - 1 claw Bowfin - 1 fragment 9 fish vertebrae 1 fish scale 14 UNFB
316	Level C	< 1 gm UNMB Catfish - 1 left pectoral spine 1 fish scale 2 fish vertebrae 3 UNFB
316	General	< 1 gm UNMB Rabbit - 1 distal tibia 2 UNBB Gar - 1 scale Bowfin - 1 vertebra Catfish - 1 right cleithrum (small) 17 fish vertebrae 2 fish scales 10 UNFB
323	All	< 1 gm UNMB 6 fish vertebrae 2 fish scales 12 UNFB cf. Lampsilis - 1 left valve Polygyrid - 1 lip fragment 1 terrestrial gastropod 7 Hawaiia miniscule shells
324	All	< 2 gm UNMB 2 fish vertebra 4 UNFB 2 Hawaiia 1 "Zonitoides" wide umbilus
325	All	6.5 gm UNMB White-tailed deer - 1 sesmoid 1 distal phalange 1 vertebra disc

FEATURE	PROVENIENCE	FAUNAL REMAINS
325 (Continued)	All	White-tailed deer - 1 dew claw metatarsal 1 rib fragment - proximal Rabbit - 1 left jaw fragment 1 proximal radius Squirrel - 1 incisor 2 cheek teeth 1 humerus shaft 1 astragulas 2 UNBB Turtle - 5 fragments Snake - 1 rib Bowfin - 1 fragment Catfish - 1 right spine (small) 1 scapula fragment Bass - 1 right premaxilla (small) 17 fish vertebrae 29 UNFB 6 fish scales 5 indeterminate land snails
327		< 1 gm UNMB 3 fish vertebrae 7 fish scales 6 UNFB
327	Level 2	< 2 gm UNMB Squirrel - 1 molar 1 right distal humerus Passerine - 1 fragment Kinosternidae - 1 marginal 6 fish vertebrae 8 UNFB
330		Human - 1 molar 29 gm UNMB White-tailed deer - 1 proximal rib fragment 1 distal phalange 1 sesmoid 1 left jaw frag. lower M3 unerupted Squirrel - 3 cheek teeth 1 incisor 1 distal left humerus 4 UNBB Mud/Musk - 2 plastron fragments 1 marginal

FEATURE	PROVENIENCE	FAUNAL REMAINS
330 (Continued)		Turtle - 6 fragments Boxturtle - 1 marginal 2 pleurals Snake - 1 vertebra Bass - 1 left premaxilla (small) Gar - 2 scales 1 vertebra Channel Catfish - 1 right dentary Bowfin - 2 vertebrae 41 fish vertebrae 5 fish scales 10 UNFB 1 indeterminate clam 9 indeterminate aquatic snails
331	Stratum A	3 gm UNMB Duck - 1 furculum 3 UNBB Turtle - 2 fragments 5 fish vertebrae 35 UNFB < 1 gm Bivalves 11 fish scales
331	Stratum B	< 1 gm UNMB 1 UNFB
331	General	< 4 gm UNMB Squirrel - 1 lower 1st molar 1 calcaneum (digested) Channel Catfish - 1 spine fragment Turtle - 3 fragment Drum - 1 plate 1 pelvic sp. Passerine - 1 distal tibiotarsus Gar - 5 scale fragments 33 fish vertebrae 26 fish scales 62 UNFB 2 UNBB
332		5 gm UNMB White-tailed deer - 1 distal metapo- dial epiphysis 1 proximal pha- lange 1 cervical vert. Squirrel - 1 left radius Gray fox - radius Dog - 1 radius

FEATURE	PROVENIENCE	FAUNAL REMAINS
334	All	< 1 gm UNMB Raccoon - 1 molar Squirrel - 1 molar Rabbit - 1 astragalus Turtle - 1 fragment Ictalurus - 1 pectoral spine Bowfin - 1 Maxilla? 6 fish vertebrae 14 fish scales 21 UNFB
343	All	30 gm UNMB Squirrel - 1 parietal Rabbit - 1 proximal right femur White-tailed deer - 7 fragments antler (B) 6 UNBB Softshell turtle - 1 pleural frag. (small) Slider/Map/Painted turtle - 1 hyoplastron fragment Snake - 1 vertebra Bowfin - 2 vertebrae Drum - 1 tooth 3 fish vertebrae 2 fish scales 14 UNFB 1 indeterminate aquatic snail 1 Viviparus
345		3 gm UNMB Turtle - 2 fragments
367	All	< 2 gm UNMB Turtle - 1 fragment 1 UNBB 1 fish vertebra 2 fish scales 2 UNFB
375		< 1 gm UNMB 1 UNBB 8 fish vertebrae 9 UNFB Drum - 1 tooth
380	All	12.5 gm UNMB White-tailed deer - 1 tooth fragment Rabbit - 1 right astragalus

FEATURE	PROVENIENCE	FAUNAL REMAINS
380 (Continued)	All	Squirrel - 1 tooth 1 right premaxilla 1 distal humerus Passerine - 1 beak Duck - 1 tarsometatarsus fragment 6 UNBB Softshell turtle - 1 fragment Turtle - 1 pleural fragment cf. Centrarchid - 1 quadrate 1 hyomand. Gar - 3 scales 47 fish vertebrae 5 fish scales 32 UNFB
406		< 1 gm UNMB
409		< 1 gm UNMB cf. White-tailed deer - 1 tooth 1 UNBB Turtle - 1 fragment
412		1.5 gm UNMB Turtle - 1 fragment 3 fish scales 7 fish vertebrae 14 UNFB
413	All	Human - 1 tooth 14 gm UNMB White-tailed deer - 1 antler frag. 6 small tooth fragments Squirrel - 1 proximal left tibia 1 distal humerus 1 incisor fragment 2 UNBB Turtle - 2 fragments Centrarchid - 1 quadrate Bowfin - 1 vertebra (large) 56 fish vertebra 30 fish scales 1 UNFB
417	All	< 10 gm UNMB Rabbit - 1 proximal left tibia Squirrel - 1 clavicle 1 left calcaneum 1 astragulas 1 incisor

FEATURE	PROVENIENCE	FAUNAL REMAINS
417 (Continued)	All	4 UNBB Turtle - 7 fragments Boxturtle - 1 marginal Snake - 1 vertebra Gar - 1 scale 1 fragment 39 fish vertebrae 10 fish scales 150 UNFB
419	General	< 1 gm UNMB Squirrel - 1 right tibia White-tailed deer - 1 antler tine 1 2nd phalange Turkey - 1 distal right ulna 2 UNFB 1 indeterminate unio
428		< 1 gm UNMB (B) Catfish - 2 pectoral spine frag. (B) 2 UNFB
596		< 1 gm UNMB Squirrel - 1 tooth 8 UNFB 2 fish vertebrae 1 Zonitoides arboreus
617	All	< 2 gm UNMB Squirrel - 1 molar 1 distal right tibia 1 proximal right ulna cf. Goose - 1 sternum 3 UNBB Turtle - 6 fragments Boxturtle - 1 marginal Bowfin - 1 vertebra Catfish - 1 cleithrum 1 basioccipital 31 fish vertebrae 18 fish scales 25 UNFB
635		< 1 gm UNMB 1 fish scale 3 UNFB
656	All	16 gm UNMB White-tailed deer - 2 tooth frag. Passerine - 1 distal tibiotarsus

FEATURE	PROVENIENCE	FAUNAL REMAINS
656 (Continued)	All	Squirrel - 3 cheek teeth 1 maxilla fragment 1 molar 4 UNBB Frog/Toad - 1 long bone Turtle - 4 fragments Snake - 2 vertebrae Bass - 1 vomer 1 premaxilla Centrarchid - 1 quadrate Catfish - 6 spines (2 left, 4 right) (5 ind.) 1 left cleithrum 1 basioccipital 1 weberian apparatus 1 right cleithrum (small) Channel Catfish - 1 spine fragment Bullhead - 1 left dentary Drum - 1 otolith 1 tooth 1 plate fragment 1 vomer Bowfin - 15 vertebrae Gar - 3 vertebra 1 scale Minnow - 1 gill arch 511 UNFB 386 fish vertebrae 21 fish scales Polygyrid - 1 2 indeterminate unionid
657	Stratum A	10 gm UNMB Squirrel - 1 tooth 1 incisor 1 proximal left ulna 1 proximal scapula 1 distal humerus 2 distal right femura 1 astragulas 2 UNBB Turtle - 2 fragments Colubrid - 1 vertebra Frog/Toad - 1 ilium Bowfin - 2 vertebrae Gar - 3 scales 56 fish vertebrae 115 UNFB 27 fish scales (centrarchid?) 1 cf. polygyria fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
657	Stratum A	1 indeterminate unio
(Continued)		1 zonitid shell
		Tritigonia verrucosa - 1 left valve
657	Stratum B	< 3 gm UNMB
		1 UNBB
		Turtle - 2 fragments
		9 fish vertebrae
		11 UNFB
		Gar - 1 scale
		1 indeterminate unionid
		1 zonitid
657	General	1 gm UNMB
		White-tailed deer - 1 tooth fragment
		Turtle - 2 fragments
		Bowfin - 1 vertebra
		5 fish vertebrae
		1 indeterminate unionid
659	Stratum C	1 indeterminate Unio (B)
		< 1 gm UNMB
		1 UNBB
		1 fish vertebra
659	Stratum D	< 1 gm UNMB
		1 UNFB
		2 Hawaiia
		1 fish scale
659	Stratum E	< 1 gm UNMB
		1 fish vertebra
		1 UNFB
659	General	8.5 gm UNMB
		White-tailed deer - 1 distal dew claw
		Rabbit - 1 molar
		Squirrel - 1 tooth
		1 pelvis fragment
		2 UNBB
		Turtle - 5 fragments
		Bowfin - 1 palatine fragment
		8 vertebra
		1 tooth patch
		Catfish - 1 pectoral spine fragment
		Drum - 1 otolith
		52 fish vertebrae
		160 UNFB
		24 fish scales
		1 Unio fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
659 (Continued)	General	4 Hawaiia 1 Helicodiscus 2 indeterminate
660	General	7.5 gm UNMB White-tailed deer - 1 prox. left tarsometatarsus 1 metapodial frag. 4 UnBB Channel catfish - 1 pectoral spine Drum - 1 plate Gar - 2 scales 21 fish vertebrae 26 UNFB
664		< 1 gm UNMB 1 fish scale
680		< 1 gm UNMB Squirrel - 1 tooth 1 fish vertebra 3 UNFB
684		3.5 gm UNMB Squirrel - 1 incisor 1 molar Mouse - 1 incisor 8 UNBB 1 UNBB-ossified cartilage - trochea Turtle - 1 fragment Snake - 1 vertebra Gar - 2 vertebrae 1 scale 2 skull plates Bowfin - 14 vertebrae 4 tooth patches Catfish - 1 right spine 1 right artic Centrarchidae - 1 vomer small 125 fish vertebrae 44 fish scales 221 UNFB 1 indeterminate unio
684A		1 gm UNMB Raccoon - 1 left upper PM4 White-tailed deer - 1 proximal 3rd phalange Kinosternid - 1 marginal 1 fish vertebra

FEATURE	PROVENIENCE	FAUNAL REMAINS
689	General	4.9 gm UNMB White-tailed deer - 1 sesmoid 1 dew claw 5 UNBB cf. Raccoon - 1 incisor Squirrel - 2 cheek teeth 2 astragali (right, left, 1 digested) Passerine - 2 humerus fragments 1 vertebra Turtle - 6 fragments (1 digested) 2 long bones Snake - 1 vertebra Bowfin - 2 vertebrae Gar - 2 scales Catfish - 1 right spine Centrarchid - 1 cleithrum fragment 1 preoper. fragment 50 fish vertebrae 78 UNFB 97 fish scales Unio fragment
690		10 gm UNMB cf. White-tailed deer - 1 distal humerus
694		Kinosternid - 1 plastron fragment
719		< 1 gm UNMB Bowfin - 1 vertebra Centrarchidae - 1 right artic (small) 6 fish vertebrae 2 UNFB 1 unionid
728		4.5 gm UNMB Squirrel - 1 distal tibia White-tailed deer - 1 digested sesmoid Turtle - 4 fragments cf. Channel catfish - 1 left cleithrum 8 fish vertebrae 11 fish scales 32 UNFB
736		7.5 gm UNMB White-tailed deer - 1 tooth Passerine? - 1 ulna Snake-nonpoisonous - 6 vertebrae Gar - 1 scale

FEATURE	PROVENIENCE	FAUNAL REMAINS
736 (Continued)		Drum - 1 quadrate (B) small 9 fish vertebrae 2 fish scales 9 UNFB
739		< 1 gm UNMB 5 fish vertebrae 8 UNFB Bowfin - 1 fragment 2 vertebrae 1 indeterminate clam
740		< 2 gm UNMB 1 UNBB Bowfin - 2 vertebrae 12 fish vertebrae 24 UNFB 1 unionid - cut?
746		20 gm UNMB Squirrel - 1 left astragalus 5 UNBB Turtle - 3 fragments Frog/Toad - 1 vertebra 1 long bone Snake - 1 vertebra Bowfin - 5 vertebrae Gar - 1 vertebra 2 scales Catfish - 1 cleithrum fragment cf. Lepomis - 1 vomer 99 fish vertebrae 14 fish scales 67 UNFB
747		1 gm UNMB Raccoon - 1 right maxilla fragment Rabbit - 1 molar Passerine - 1 distal tarsometatarsus 2 UNBB Bowfin - 1 vertebra Catfish - 1 skull fragment 5 fish vertebrae 4 fish scales 39 UNFB
748	Segment A	1 gm UNMB Rabbit - 1 left ulna Catfish - 1 left pectoral spine Bowfin - 1 vertebra

FEATURE	PROVENIENCE	FAUNAL REMAINS
748 (Continued)	Segment A	6 fish vertebrae 24 UNFB 2 fish scales
748	Segment C	< 1 gm UNMB Squirrel - 1 astragalus
748	General	< 2 gm UNMB Rabbit - 1 incisor fragment Squirrel - 1 tooth 1 incisor 3 UNBB Boxturtle - 2 marginals Gar - 1 skull fragment 30 fish vertebrae 18 UNFB 2 fish scales
749	Level A	White-tailed deer - 1 antler tine (slight polish on tip-natural?)
756	All	6.5 gm UNMB 1 UNMB (chewed) Mouse - 1 upper incisor 1 lower incisor 1 humerus 1 left jaw Rabbit - 1 max. fragment Squirrel - 1 incisor fragment 1 molar 1 right pelvis Duck - 1 distal carpometacarpus 3 UNBB Turtle - 7 fragments Noturus? - 1 spine fragment Snake - 1 vertebra Channel Catfish - 1 artic Gar - 1 skull fragment Bowfin - 3 vertebrae 18 fish vertebrae 4 fish scales 74 UNFB
762		Mouse - 1 incisor fragment Rabbit - 1 cheek tooth 1 distal humerus (b) Gar - 4 bones Bowfin - 1 vertebra 5 fish vertebrae 27 UNFB 1 indeterminate clam

FEATURE	PROVENIENCE	FAUNAL REMAINS
763		< 1 gm UNMB
		Mouse - 1 incisor
		Turtle - 1 fragment
		3 fish vertebrae
		2 UNFB
766		1 indeterminate unio
774		< 7 gm UNMB
		Squirrel - 1 left humerus
		1 fibular fragment
		1 tooth
		White-tailed deer - 1 premolar
		3 UNBB
		Turtle - 3 fragments
		Catfish - 1 scapula fragment
		Bowfir - 2 vertebrae
		Drum - 1 plate fragment
		32 fish vertebrae
		7 fish scales
		57 UNFB
784		Duck - 1 tibiotarsus
		1 fish vertebra
		1 indeterminate unio
790		< 1 gm UNMB
		1 UNBB
		Passerine - 1 distal humerus
		Turtle - 1 fragment
		3 fish vertebrae
818		< 1 gm UNMB
		1 UNBB
905	All burial fill	30 gm UNMB
		White-tailed deer - 1 calcaneum frag.
		1 dist metacarpal (grooved on sides, distal end cut/broken off?)
		Mouse - 1 proximal left femur
		Squirrel - 1 radius
		2 teeth
		1 astragalus
		1 fibula fragment
		Rabbit - 1 distal humerus
		White-tailed deer - 1 frag. premaxilla
		Hawk - 1 claw

FEATURE	PROVENIENCE	FAUNAL REMAINS
905 (Continued)	All burial fill	Passerine - 1 proximal tibiotarsus 1 artic 1 ulna Duck - 1 scapula 13 UNBB Boxturtle - 2 fragments Colubrid - 1 vertebra Snake - 4 vertebrae Turtle - 10 fragments Frog/Toad - 1 long bone Centrarchid - 1 artic 1 preoperculum Drum - 2 otolith Bowfin - 5 vertebrae Minnow - 1 gill arch Gar - 12 scales 1 skull fragment 1 vertebra Catfish - 1 spine fragment 2 cleithrum fragment (right, left) 1 right spine Channel Catfish - 1 right pectoral spine 198 UNFB 170 fish vertebrae 16 fish scales Gastrocopta contracta - 1 shell Helicodiscus parallelus - 2 shells Zonitidae - 2 shell 6 indeterminate polygyrid 8 cf. Viviparus georgiana 11 indeterminate land snails 9 Hawaiia 3 Helicodiscus 2 unionid
Late Baytown Affiliation		
45		< 1 gm UNMB
133	All	1 UNMB-bipointed object (fish gorge?) < 2 gm UNMB Squirrel - 1 incisor fragment 2 UNBB 2 UNFB 2 fish vertebrae 13 fish scales

FEATURE	PROVENIENCE	FAUNAL REMAINS
257	Level 1	< 1 gm UNMB (B) White-tailed deer - 1 3rd digit (B)
257	Level 3	< 1 gm UNMB 1 UNFB
257	Level 7	< 1 gm UNMB
257	General	1 gm UNMB (B)
284	General	< 2 gm UNMB Bowfin - 2 vertebra 6 fish vertebrae 8 UNFB 4 fish scales Pupillidae - 1
300	All	< 2 gm UNMB Squirrel - 1 right scapula 4 UNBB Turtle - 1 digit Bowfin - 1 vertebra Gar - 1 scale 4 fish scales 8 fish vertebrae 15 UNFB 2 Unio fragment
306	Level A	4 gm UNMB Squirrel - 1 tooth Raccoon - 1 right M1 Rabbit - 1 left calcaneum 3 UNBB Toad - 1 right ilium Boxturtle - 1 humerus 1 dentary Turtle - 2 fragments Bowfin - 1 vertebra Catfish - 2 (right, left) spines 59 UNFB 5 fish scales 55 fish vertebrae
306	Level B	< 1 gm UNMB Squirrel - 1 calcaneum 3 fish vertebrae 2 UNFB
306	Level C	< 1 gm UNMB 2 fish vertebrae

FEATURE	PROVENIENCE	FAUNAL REMAINS
306	General	2.5 gm UNMB 1 UNBB-articular 3 UNBB Turtle - 3 fragments 14 fish vertebrae 18 UNFB
317		15 gm UNMB River otter? - 1 proximal left femur 1 distal left scapula Deer - 1 proximal 1st phalange Rabbit - 1 cheek tooth Squirrel - 1 incisor 1 pelvis 1 occipital Mouse - 1 incisor 9 UNBB Turtle - 4 fragments Snake - 1 vertebra Ictiobus, cf. Buffalo - 1 right cleithrum Bowfin - 10 vertebrae 2 fragments Gar - 2 vertebrae 2 scales 1 parasphenoid Catfish - 3 left spines (small) 81 fish vertebrae 5 fish scales 138 UNFB
376	Stratum A	4 gm UNMB Squirrel - 1 left frontal 3 tooth fragments 2 calcanea (right, left) Rabbit - 2 molars 4 UNBB Turtle - 8 fragments Slider/Map - 1 humerus Poisonous snake - 1 vertebra Bowfin - 12 vertebrae Gar - 4 scales 1 skull fragment Catfish - 1 fragment 15 fish scales 195 fish vertebrae 242 UNFB
376	Stratum B	2.3 gm UNMB Turtle - 2 carpace fragments 1 long bone

FEATURE	PROVENIENCE	FAUNAL REMAINS
376 (Continued)	Stratum B	Bowfin - 1 vertebra 8 fish vertebrae 7 UNFB
376	Stratum C	1 gm UNMB (1 chewed) Squirrel - 1 molar 1 left radius Passerine - 1 proximal Tarsometatarsus 1 UNBB Turtle - 3 fragments Frog/Toad - 2 ilium (2 species, small) Minnow - 1 gill arch Bowfin - 1 vertebra Gar - 1 scale 2 fish scales 54 fish vertebrae 215 UNFB
376	General	< 1 gm UNMB Rabbit - 1 distal femur Squirrel - 2 incisor fragments 2 teeth Turtle - 5 fragments (1 digested) Bowfin - 1 tooth patch 5 vertebrae Gar - 2 scales Catfish - 1 pectoral spine Centrarchidae, cf. Leposmis - 1 cleithrum fragment 12 fish scales 90 fish vertebrae 137 UNFB Unio fragment
403	All	9.5 gm UNMB Squirrel - 1 tooth 1 astragalus Rabbit - 1 distal humerus Deer - 1 pelvis fragment 5 UNBB Toad - 1 right ilium 3 fragments Frog/Toad - 1 vertebra Drum - 1 plate fragment Bowfin - 1 vertebra 1 subocular Centrarchid - 1 posttemporal Channel catfish - 1 right dentary 12 fish scales 24 fish vertebrae

FEATURE	PROVENIENCE	FAUNAL REMAINS
403	All	39 UNFB
(Continued)		1 indeterminate Unio
610	All	< 2 gm UNMB
		Squirrel - 2 teeth
		1 right calcaneum
		cf. Gray Fox - 1 left ilium
		Deer - 2nd phalange - arthr[illegible]ic?
		1 carpal
		2 teeth
		1 distal metatarsal (chewed)
		1 jaw fragment
		Mouse - 1 upper incisor
		2 UNBB
		Turtle - 6 fragments
		Gar - 4 scales
		1 skull fragment
		Bowfin - 1 vertebra
		Catfish - 1 scapula
		Channel Catfish - 1 left cleithrum
		38 fish vertebrae
		21 fish scales
		51 UNFB
658	All	Human - 1 tarsal
		14 gm human bone
		Gar - 1 skull fragment
		Drum - 2 otoliths
		Turtle - 1 fragment
		Catfish - 1 left pectoral
		Bowfin - 2 vertebrae
		18 fish vertebrae
		43 fish scales
		18 UNFB
		58 Hawaiia miniscula
		2 polygyrids
		2 indeterminate polygyrids
		4 Zonitoides?
		3 Zonitoides
		1 Zonitoides arboreum
		2 indeterminate zonitid
		2 Viviparus
		1 cf. Helisoma sp.
		3 indeterminate land snail
		3 indeterminate aquatic gastropods
		12 indeterminate gastropods
		1 cf. Mesodon thyroides
		1 unionid
691		< 1 gm UNMB
		Drum - 1 otolith

FEATURE	PROVENIENCE	FAUNAL REMAINS
691 (Continued)		3 fish vertebrae
		10 UNFB
725		< 1 gm UNMB
		Squirrel - 1 tooth
		2 UNBB
		Boxturtle - 1 marginal
		Viparidae - 2 vertebrae
		Gar - 1 scale
		Bowfin - 1 vertebrae
		Drum - 1 fg. plate
		7 fish vertebrae
		8 fish scales
		12 UNFB
		4 Helicodiscus
		1 Viviparus?
		1 Unionidae fragment
		3 aquatic snail fragments
729	All	42 gm UNMB (2 frag. chewed)
		1 worked UNMB splinter
		Squirrel - 1 left upper incisor
		1 calcaneum
		2 astragalus
		2 molars
		4 cheek teeth
		3 teeth
		2 incisors
		1 right astragalus
		Rabbit - 1 distal humerus
		Raccoon - 1 left upper M3
		Deer - 1 carpal
		1 sesmoid
		Mouse - 1 upper incisor
		1 humerus
		1 ulna
		1 tooth
		cf. Chipmunk - 1 cheek tooth
		Passerine - 1 distal humerus
		1 vertebra
		1 prox Tibiotarsus
		1 distal tibiotarsus
		1 digit
		9 UNBB
		Boxturtle - 1 marginal
		Salamander - 2 vertebrae
		Turtle - 5 fragments
		Bowfin - 39 vertebrae (2 small)
		1 tooth patch
		1 fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
729 (Continued)	All	Gar - 6 scales Catfish - 3 left spines (2 small) 2 left spines 1 right cleithrum Bullhead - 1 right dentary Drum - 2 teeth Minnow - 1 gill arch 298 fish vertebrae 92 fish scales 283 UNFB 1 indeterminate unio
841	All	27.5 gm UNMB Deer - 1 distal right humerus (rodent chewed) 1 antler tine chopped Squirrel - 1 distal left tibia cf. Turkey - 1 tarsometatarsus shaft 1 proximal tarsometatarsus
842		Deer - 1 left astragalus 2 proximal phalanges 2 indeterminate unionids (1 cut? into square)
1001		1 indeterminate unionid
1003	A & B mixed	< 1 gm UNMB Mouse - 1 ulna fragment Frog/toad - 1 ilium fragment 2 fish vertebrae 1 fish scale 7 UNFB
1003	Section A	10 gm UNMB Squirrel - 1 incisors 3 teeth (2 broken) cf. Deer - 1 astragalus fragment Deer - 1 distal unfused metapodial Mouse - 2 upper incisors 1 lower incisor 1 pelvis Mink - 1 jaw condyle Boxturtle - 4 marginals Snapper - 1 marginal Turtle - 1 fragment Frog/Toad - 2 vertebrae 1 radio-ulna 1 humerus Bass - 1 articular

FEATURE	PROVENIENCE	FAUNAL REMAINS
1003 (Continued)	Section A	Drum - 1 otolith 1 plate fragment Catfish - 1 left spine Gar - 3 scales 2 vertebrae 1 right dentary (large) 2 (left, right) premaxilla (2 individuals) 74 fish vertebrae 22 fish scales 84 UNFB
1003	Section B	< 1 gm cf. unionid
1003	General	6 gm UNMB Squirrel - 4 cheek teeth 1 nasal 2 parietals Rabbit - 1 cheek tooth 5 UNBB Boxturtle - 2 marginals Turtle - 1 fragment Bowfin - 1 fragment Gar - 1 fragment 6 fish vertebrae 4 fish scales 18 UNFB 2 indeterminate aquatic snail
Early Mississippian Affiliation		
196		< 1 gm UNMB 1 UNBB Turtle - 1 fragment
267		Rabbit - 1 molar Squirrel - 1 incisor 3 UNBB Passerine - 1 distal Tibiotarsus (TBT) Turtle - 2 fragments Snake - 1 vertebra Catfish - 1 quadrate 17 fish vertebrae 25 fish scales 16 UNFB 1 indeterminate gastropod
302	General	1 gm UNMB Duck (Ringneck sized) - 1 left CMC - cut distal 1/3

FEATURE	PROVENIENCE	FAUNAL REMAINS
302	General	1 UNBB
(Continued)		Boxturtle - 1 pleural
		Gar - 1 scale
		Catfish - 2 left pectoral spines
		1 fish vertebra
		1 fish scale
		6 UNFB
		1 Viviparus
302	Level A	1 gm UNMB
		1 UNBB
		Turtle - 1 fragment
		9 fish vertebrae
302	Level B	1 UNMB (ground to tapered blunt-rounded point)
		Deer - 1 3rd phalange
		1 sesmoid
		Squirrel - 1 right ulna
		Passerine - 1 proximal humerus
		1 distal tarsometatarsus
		8 UNBB
		Snake - 1 rib
		Softshell - 1 fragment
		Turtle - 5 fragments
		Boxturtle - 1 pleural
		Kinosternid? - 1 marginal
		Centrarchid - 1 small quadrate
		Catfish - 4 cleithrum (2 right, 2 left, 3 ind.)
		2 right spines (2 ind.)
		1 jaw fragment
		1 left dentary
		Gar - 2 scales
		Bowfin - 3 vertebrae
		2 fragments
		45 UNFB
		33 fish vertebrae
		7 fish scales
365	All	< 2 gm UNMB
		Squirrel - 1 tooth
		1 astragalus
		5 UNBB
		Bullfrog - 1 left ilium
		Turtle - 11 fragments
		Boxturtle - 1 pleural
		Kinosternid - 1 marginal
		Gar - 4 vertebrae
		Bowfin - 2 vertebrae
		1 fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
365 (Continued)	All	43 fish vertebrae
		26 fish scales
		16 UNFB
414		1 human molar fragment
		11 gm UNMB
		2 UNBB
		Turtle - 4 fragments
		Centrarchid - 1 right hyomandibular <140 mm
		Bowfin - 18 vertebrae
		1 dentary?
		Gar - 1 scale
		Catfish - 6 cleithrum (4 right, 2 left)
		1 post temporal
		1 weberian apparatus
		1 left spine
		1 right articular
		45 fish vertebrae
		14 fish scales
		63 UNFB
		2 indeterminate zonitids
430	All	34 gm UNMB
		Raccoon - 1 molar
		Rabbit - 1 cheek tooth
		Mink - 1 right M1-lower
		Muskrat - 1 left jaw
		Squirrel - 5 cheek teeth
		3 teeth fragments
		1 incisor fragment
		1 incisor
		1 fibula fragment
		1 astragalus
		2 calcaneum (right, left)
		1 left ulna
		1 right scapula
		Squirrel? - 1 humerus
		Mouse - 1 incisor
		Pine vole - 1 left M1
		Duck (medium-small) - 1 distal humerus
		1 furculum
		Passerine - 1 distal tarsometatsus
		1 tibiotarsus
		30 UNBB (1 goose size)
		Kinosternid - 2 marginals
		Snapping turtle - 2 marginals
		Boxturtle - 1 skull fragments
		4 marginals

FEATURE	PROVENIENCE	FAUNAL REMAINS
430 (Continued)	All	cf. Slider - 1 scapula/corcoid Turtle - 18 fragments 1 vertebra Frog/Toad - 1 right ilium (tiny) 1 fragment 1 skull fragment max? Poisonous snake - 1 vertebra Drum - 3 teeth cf. Spotted gar - 2 premaxilla (right, left) 1 ind. ca. 30" Gar - 14 fragments 12 scales 2 vertebrae Bowfin - 25 vertebrae 1 fragment 1 dentary? fragment Catfish - 7 spines (2 right, left; 3 left, right; 2 very small) 4 fragments 1 post temporal 1 maxilla 6 cleithrums 2 articular 1 dentary 1 hyomandibular Bass - 3 right maxilla (small-med.) 321 fish vertebrae 16 fish scales 369 UNFB 1 indeterminate aquatic snail 4 indeterminate Unio
433	Stratum A	2.5 gm UNMB Human - 1 tooth crown fragment Deer - 1 dew claw mt. (b) Raccoon - 1 left mandible cf. Myotis bat - 1 right jaw Squirrel - 1 left calcaneum 1 UNBB Boxturtle - 4 pleurals Kinosternid - 1 marginal Turtle - 2 fragments Frog/Toad - 1 fragment Freshwater drum - 1 plate Gar - 2 vertebrae 2 scales Bowfin - 2 vertebrae Catfish - 1 vertebra 1 right quadrate

FEATURE	PROVENIENCE	FAUNAL REMAINS
433 (Continued)	Stratum A	25 fish vertebrae
		28 fish scales
		63 UNFB
433	Stratum B	1 gm UNMB
		Centrarchid - 1 left quadrate
		6 UNFB
		3 fish vertebrae
433	Stratum C	< 1 gm UNMB
		Catfish - 1 articular
		3 UNFB
		3 fish vertebrae
654	All	1 sharpened bone fragment (very sharp narrow point)
		< 12 gm UNMB
		Rabbit - 1 distal humerus
		Turtle - 1 fragment
		1 UNBB
		Nonpoisonous Snake - 1 vertebra
		Bowfin - 1 vertebra
		8 fish vertebrae
		1 fish scale
		29 UNFB
753		3 gm UNMB
		White-tailed deer - 1 sesmoid
		Squirrel - 1 incisor
		Raccoon - 1 lower molar
		2 UNBB
		Turtle - 4 fragments
		Snake - 1 vertebra
		Bowfin - 2 vertebrae
		Catfish - 1 left articular
		9 fish vertebrae
		12 UNFB
788		1 gm UNMB
		Squirrel - 1 molar
		Mouse - 2 distal humerus
		Mouse/Chipmunk - 2 incisors
		Passerine - 1 carpometacarpus
		Turtle - 2 fragments
		Catfish - 1 right pectoral spine 1 max. fragment
		6 fish scales
		10 fish vertebrae
		11 UNFB

FEATURE	PROVENIENCE	FAUNAL REMAINS
903		11 gm UNMB
		Rabbit - 1 cheek tooth
		Muskrat - 1 left tibia
		Squirrel - 1 tooth
		1 right calcaneum
		1 incisor fragment
		Mouse - 1 humerus
		1 lower incisor
		Duck - 1 right carpometacarpus
		Kinosternid - 2 marginals
		Turtle - 11 fragments
		Frog - 1 humerus
		Drum - 1 tooth
		Bowfin - 1 vertebra
		3 fragments
		Gar - 1 vertebra
		2 fragments
		4 scales
		Catfish - 2 spines (right, left; large and small)
		1 maxilla fragment
		41 fish vertebrae
		6 fish scales
		38 UNFB

Features With Undetermined Cultural Affiliation

FEATURE	PROVENIENCE	FAUNAL REMAINS
4		1.5 UNMB
30	All	< 2 gm UNMB
		Bowfin - 1 vertebra
		1 UNFB
31		< 1 gm UNMB
36		< 1 gm UNMB
		Bowfin - 1 vertebra
		2 fish vertebrae
		4 UNFB
60	All	1 fish scale
62		< 1 gm UNMB
		1 UNFB
63		< 1 gm UNMB
		Bowfin - 1 vertebra
		1 Hawaiia sp.

FEATURE	PROVENIENCE	FAUNAL REMAINS
66	All	< 2 gm UNMB 1 fish vertebra 2 fish scales
68		< 1 gm UNMB
78	All	< 2 gm UNMB Boxturtle - 1 pleural Turtle - 2 fragments 7 fish vertebrae 5 UNFB
81	All	< 2 gm UNMB 13 fish vertebrae 3 fish scales 18 UNFB
82	All	< 2 gm UNMB 1 fish vertebra 3 fish scales
85	All	< 2 gm UNMB Turtle - 1 fragment 1 fish scale
87		< 1 gm UNMB 1 fish vertebra
91	All	< 2 gm UNMB 1 UNFB
94	General	< 1 gm UNMB 6 UNFB 1 fish vertebra 1 fish scale
94	Stratum A&B	< 1 gm UNMB 1 fish scale 4 UNFB
95	All	< 2 gm UNMB 2 fish scales 1 UNFB
103		< 1 gm UNMB 2 UNFB
107		4 gm UNMB 1 UNBB

FEATURE	PROVENIENCE	FAUNAL REMAINS
108		< 1 gm UNMB
		1 UNBB
		1 UNFB
113		< 1 gm UNMB
		1 UNBB
		2 fish scales
		1 UNFB
114		< 1 gm UNMB
		Gar - 1 scale fragment
		Bowfin - 1 fragment
123	All	< 1 gm UNMB
132		< 1 gm UNMB
		1 fish vertebra
138		< 1 gm UNMB
		Mouse - 1 ulna fragment
		Bowfin - 3 small vertebrae
		2 skull fragments
		1 fish vertebra
		17 fish scales
		6 UNFB
141		< 1 gm UNMB
		1 fish vertebra
		1 UNFB
142		< 1 gm UNMB
		1 fish scale
		1 UNFB
144		< 1 gm UNMB
		1 fish vertebra
161		< 1 gm UNMB
167		< 1 gm UNMB
		1 fish scale
174		< 1 gm UNMB
179		< 1 gm UNMB
199		< 1 gm UNMB
		1 UNFB
204		< 1 gm UNMB
		1 UNBB

FEATURE	PROVENIENCE	FAUNAL REMAINS
204 (Continued)		Bowfin - 1 vertebra 1 fish vertebra 1 fish scale 6 UNFB
207		Turtle - 1 fragment 1 fish vertebra 2 fish scales 9 UNFB
208		< 1 gm UNMB 1 fish scale 1 UNFB
227		< 1 gm UNMB
254		< 1 gm UNMB
258		Muskrat - 1 molar Bowfin - 1 skull fragment
259		< 1 gm UNMB
272		< 1 gm UNMB 2 UNBB Toad - 2 ilium 1 humerus 7 vertebrae 1 TBF 9 bones - other Bowfin - 1 vertebra 18 fish scales 22 UNFB
276		< 1 gm UNMB
277		< 1 gm UNMB 1 UNFB
280		< 1 gm UNMB Raccoon - 1 right M1 Kinosternid - 1 marginal Nonpoisonous snake - 1 vertebra 18 fish vertebrae 3 UNFB
282		< 1 gm UNMB 1 UNBB Snake - 1 vertebra Bowfin - 1 vertebra

FEATURE	PROVENIENCE	FAUNAL REMAINS
282 (Continued)		Catfish - 1 pectoral spine fragment 8 fish vertebrae 5 fish scales 37 UNFB
283		< 1 gm UNMB
287		< 1 gm UNMB 1 fish vertebra 1 fish scale 1 UNFB
289		< 1 gm UNMB 1 UNBB Gar - 1 vertebra (B)
291		< 1 gm UNMB 3 fish vertebrae 2 UNFB 1 indeterminate bivalve
303		< 1 gm UNMB Mouse - 1 incisor 1 UNBB 2 fish vertebrae 11 fish scales
318	Level A	< 1 gm UNMB 2 fish scales 6 UNFB
318	Level B	< 1 gm UNMB 1 UNBB 1 fish vertebra 1 fish scale
322		< 1 gm UNMB Squirrel - 1 molar Turtle - 2 fragments 2 fish vertebrae
344	All	< 2 gm UNMB 2 fish vertebrae 7 fish scales 7 UNFB
357	All	< 2 gm UNMB 2 fish vertebrae 4 UNFB

FEATURE	PROVENIENCE	FAUNAL REMAINS
368		< 1 gm UNMB Turtle - 1 fragment Frog/Toad - 1 maxilla fragment Catfish - 1 quadrate Bowfin - 1 vertebra 2 fish vertebrae 14 UNFB
389		1 gm UNMB Squirrel - 1 cheek tooth Deer - 1 dew claw 1 UNBB Turtle - 1 fragment Catfish - 1 left spine 5 fish vertebra 3 UNFB
404		< 1 gm UNMB
405		< 1 gm UNMB
407		< 1 gm UNMB Turtle - 1 fragment (B)
408		< 1 gm UNMB 1 fish vertebra 1 fish scale
410		< 1 gm UNMB 1 fish vertebra
411		< 1 gm UNMB Turtle - 3 fragments 1 fish vertebra
420		> 1 gm UNMB Squirrel - 1 calcaneum (B) 1 fish scale
426		1 indeterminate unio
431		Squirrel - 1 incisor fragment Gar - 1 skull fragment 1 vertebra Drum - 1 tooth Catfish - 1 right pectoral spine 3 fish vertebrae 5 UNFB 1 bivalve fragment

FEATURE	PROVENIENCE	FAUNAL REMAINS
612		2 UNBB Turtle - 3 fragments Gar - 3 scales Catfish - 1 pectoral spine 3 fish vertebrae 4 fish scales 15 UNFB
613		< 1 gm UNMB 1 UNBB
636	All	< 2 gm UNMB 2 fish vertebrae 3 UNFB
638		< 1 gm UNMB Bowfin - 1 fragment 2 fish vertebrae 5 fish scales 4 UNFB 1 recent Zonitoides
641	All	< 1 gm UNMB Mouse - 1 upper incisor Colubrid - 34 vertebrae? Snake - 7 ribs 10 viparidae vertebrae Bowfin - 1 vertebra Gar - 1 vertebra 1 fish vertebra 1 fish scale 13 UNFB
642		< 1 gm UNMB
650	All	< 2 gm UNMB Squirrel - 1 proximal right femur 2 UNBB Turtle - 2 fragments 1 fish scale 1 UNFB
655		< 1 gm UNMB 2 fish vertebrae 4 UNFB
662		< 1 gm UNMB Turtle - 1 fragment 2 fish vertebrae 5 UNFB

FEATURE	PROVENIENCE	FAUNAL REMAINS
662 (Continued)		1 fish scale 2 - beetle thorax fragments (recent)
665		< 1 gm UNMB Squirrel - 1 distal left tibia Bullhead - 1 left operculum 1 vomer Gar - 1 scale 12 fish vertebrae 5 fish scales 15 UNFB
666		2 UNFB
667		< 1 gm UNMB Deer - 1 distal left radius (unfused) Turtle - 1 fragment 3 fish vertebrae 1 fish scale 5 UNFB
669		< 1 gm UNMB 3 UNFB 1 Hawaiia
671		< 1 gm UNMB Catfish - 1 pectoral spine 9 fish vertebrae 4 fish scales 37 UNFB
672		Microtus? - 1 tooth 2 fish vertebrae 1 fish scale 3 UNFB
673		< gm UNMB cf. Drum - 1 fragment 3 UNFB
675		< 1 gm UNMB 1 fish scale
676		< 1 gm UNMB 1 fish vertebra 1 fish scale
682		2 gm UNMB Squirrel - 1 incisor fragment Boxturtle - 1 hyoplastron fragment (B)

FEATURE	PROVENIENCE	FAUNAL REMAINS
682 (Continued)		Kinosternidae - 1 marginal Bowfin - 1 fragment Channel cat? - 1 artic 8 fish vertebrae 2 fish scales 5 UNFB
683		1 gm UNMB Mink - 1 right maxilla with M1 Turtle - 2 fragments 4 fish vertebrae 2 fish scales 8 UNFB
684B		< 1 gm UNMB Squirrel - 1 molar Bowfin - 1 vertebra 5 fish vertebrae 1 fish scale 6 UNFB
688		< 1 gm UNMB
692		< 1 gm UNMB
698		2 gm UNMB 1 UNBB Toad? - 4 vertebrae 2 humeri 1 tibiofibula 3 fish vertebrae 7 fish scales 22 UNFB
700		< 1 gm UNMB Bowfin - 1 left operculum Gar - 1 max. fragment 5 fish vertebrae 7 UNFB
705		< 1 gm UNMB Bowfin - 1 vertebra 1 fish vertebra 2 UNFB 1 Helicodiscus 1 Hawaiia
714		< 1 gm UNMB Gar - 1 scale 1 fish vertebra 1 indeterminate gastropod

FEATURE	PROVENIENCE	FAUNAL REMAINS
732		< 1 gm UNMB Turtle - 1 fragment 3 fish vertebrae 14 UNFB
742		< 1 gm UNMB 2 fish vertebrae 1 fish scale
743		< 1 gm UNMB 3 fish vertebrae 45 fish scales (cetnoid scales) 17 UNFB
744		2 gm UNMB Squirrel - 1 tooth Raccoon - 1 right calcaneum Snapping turtle - 1 marginal Turtle - 6 fragments cf. Bluegill - 1 left dentary Bowfin - 1 vertebra Catfish - 1 pectoral spine Gar - 4 scales (small) 34 fish vertebrae 14 fish scales 65 UNFB
751		< 1 gm UNMB 2 UNFB
752		< 1 gm UNMB 3 fish vertebrae 2 fish scales
757		< 1 gm UNMB 1 fish vertebra
796		Mouse - 1 left ulna 3 fish scales
799		1 gm UNMB Squirrel - 1 tooth 1 UNBB Catfish - 1 skull fragment 9 fish vertebrae 10 UNFB
800		< 1 gm UNMB Turtle - 1 fragment 2 UNFB

FEATURE	PROVENIENCE	FAUNAL REMAINS
804		< 1 gm UNMB 2 UNBB Catfish - 1 max. fragment 1 fish vertebra 2 UNFB 1 Zonitid (recent)
808		< 1 gm UNMB 1 fish scale
810		< 1 gm UNMB
811		< 1 gm UNMB Rabbit - 1 tooth Amiurus - 1 pectoral spine fragment 10 fish vertebrae 5 UNFB
812		< 1 gm UNMB Bowfin - 1 fragment 4 fish scales 2 fish vertebrae
815		< 1 gm UNMB Turtle - 1 fragment 1 fish vertebra 1 UNFB
833		< 1 gm UNMB Squirrel - 1 tooth Turtle - 2 fragments Snake - postcaudal vert. 4 fish vertebrae 2 fish scales Centrarchidae - 1 operculum fragment 7 UNFB
837		Deer - 1 proximal right tibia
839		< 1 gm UNMB
843		< 1 gm UNMB cf. Deer - 8 tooth fragments

TABLE II-2. FREQUENCIES AND PERCENTAGES OF DEER REMAINS BY CHRONOLOGICAL COMPONENT.

	BAYTOWN		LATE BAYTOWN		MISSISSIPPIAN/ BAYTOWN		MISSISSIPPIAN		INDETERMINATE		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Antler	11	20.37	1	5.88							12	14.29
Skull	1	1.85									1	1.19
Teeth	13	24.07	2	11.77			2	22.22			17	20.24
Jaw fragment	1	1.85	1	5.88							2	2.38
Axis vertebrate	1	1.85									1	1.19
Cervical	1	1.85									1	1.19
Vertebrae fragment	1	1.85									1	1.19
Distal humerus			1	5.88							1	1.19
Distal radius	2	3.70									2	2.38
Carpal			2	11.77			1	11.11			3	3.57
Distal metacarpal	1	1.85									1	1.19
Proxixmal rib	2	3.70									2	2.38
Pelvis			1	5.88							1	1.19
Femur							1	11.11			1	1.19
Proximal tibia	1	1.85									1	1.19
Tarsal	1	1.85	1	5.88							2	2.38
Astrog			1	5.88							1	1.19
Calcaneum	1	1.85									1	1.19
Sesmoid	4	7.41	1	5.88	2	66.66	1	11.11			8	9.52
Distal metacarpus			1	5.88							1	1.19
Metapod	1	1.85									1	1.19
Distal metapod	2	3.70	1	5.88							3	3.57
1st phalange	2	3.70	3	17.65			1	11.11			6	7.14
2nd phalange	1	1.85	1	5.88							2	2.38
3rd phalange	3	5.56			1	33.33	1	11.11	1	100.0	6	7.14
Dew claw	4	7.41					2	22.22			6	7.14
Total	54		17		3		9		1		84	

TABLE II-3. FREQUENCIES AND PERCENTAGES OF SQUIRREL REMAINS BY CHRONOLOGICAL COMPONENT.

	BAYTOWN		LATE BAYTOWN		MISSISSIPPIAN/ BAYTOWN		MISSISSIPPIAN		INDETERMINATE		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Incisor	10	10.87	8	14.81	4	19.05	2	7.14	4	57.14	28	13.86
Teeth	36	39.13	27	50.0	9	42.86	17	60.71			89	44.06
Skull fragment	3	3.26	5	9.26							8	3.96
Jaw	1	1.09									1	.50
Proximal scapula	1	1.09									1	.50
Scapula	1	1.09	1	1.85	1	4.76	2	7.14			5	2.48
Clavicle	1	1.09									1	.50
Humerus	2	2.17									2	1.0
Distal humerus	6	6.52									6	2.97
Ulna	2	2.17	1	1.85	2	9.52					5	2.48
Radius	2	2.17	1	1.85			2	7.14			5	2.48
Pelvis	2	2.17	1	1.85							3	1.49
Sacrum	1	1.09									1	.50
Proximal femur	1	1.09					2	7.14			3	1.49
Distal femur	2	2.17									2	1.0
Proximal tibia	1	1.09									1	.50
Tibia	1	1.09									1	.50
Distal tibia	4	4.35	1	1.85					1	14.29	6	2.97
Fibula	2	2.17			1	4.76	1	3.57			4	1.98
Astrog	10	10.87	4	7.41	1	4.76	1	3.57	1	14.29	17	8.42
Calcaneum	3	3.26	5	9.26	3	14.29	1	3.57	1	14.29	13	6.44
Total	92		54		21		28		7		202	

TABLE II-4. FREQUENCIES AND PERCENTAGES OF RABBIT REMAINS BY CHRONOLOGICAL COMPONENT.

	BAYTOWN		LATE BAYTOWN		MISSISSIPPIAN/ BAYTOWN		MISSISSIPPIAN		Total	
	#	%	#	%	#	%	#	%	#	%
Tooth	6	33.33	4	50.00	1	100.0	13	56.52	24	48.00
Incisor	1	5.56					1	4.35	2	4.00
Skull	1	5.56					2	8.70	3	6.00
Jaw	1	5.56					2	8.70	3	6.00
Distal humerus	2	11.11	2	25.00			1	4.35	5	10.00
Radius	1	5.56							1	2.00
Ulna	1	5.56							1	2.00
Proximal femur	1	5.56							1	2.00
Distal femur			1	12.50					1	2.00
Proximal tibia	1	5.56							1	2.00
Distal tibia	1	5.56							1	2.00
Calcaneum			1	12.50			1	4.35	2	4.00
Astrog	2	11.11							2	4.00
Metapod							3	13.04	3	6.00
Total	18		8		1		23		50	

The excavated Baytown component at this site is lacking much evidence of the meatier portions of the deer, that is the legs. The Late Baytown and Mississippian samples show a similar bias toward skull and lower leg elements.

This skewed sample of deer elements may be explained by one of three hypotheses: 1) the classic evidence used to support the idea of the :Schlepp effect," only the head and foot elements would be represented in animals killed far from the site and the skin an flesh were returned to the site, leaving the long bones, rib cage and vertebral column at the kill site; 2) the portion of the site excavated contained a butchering area or refuse area and the food was cooked and consumed at another part of the site; or 3) the people occupying this site were not actually consuming the legs of the deer on site for one of two possible reasons, the legs were taken to another site for later consumption or the legs were taken elsewhere as a form of tribute.

Hypothesis one has not been substantiated ethnographically and hypothesis two is merely a lame excuse for not finding the deer bones. The third hypothesis, that the meatier portions of the deer were sent to another village as tribute or as trade items, is not new. The ethnographic literature for the Natchez documents the offering of deer legs as tribute (e.g. La Page duPratz 1975).

There is archaeological evidence of differential access to cuts of meat based on social status (e.g. Bogan 1980). However, to invoke such an hypothesis to explain the interesting patterning seen in deer remains at 3CT50 might be stretching the imagination. This hypothesis would assume that there was some degree of ascribed status for certain individuals, either at the site or in the immediate vicinity or a developing stratification either in the village on at least in the local area. This, of course, would set the stage for the later full scale development of stratified societies in the Mississippian period. However, the comparative evidence from other analyses of feature remains (particularly human burials--see Rose, this volume) does not offer particularly strong support for such stratification. There is one burial in which a juvenile appeared to have been given some sort of special treatment; four posts were identified in the feature and their orientation suggest some type of superstructure above the grave or a funeral bed on which the body had been laid prior to burial.

Consequently, the occurrence of deer remains were plotted across the site to look for any other aspects that might help explain the distribution of certain elements. The only additional trends observed were that deer elements appeared to cluster in areas to the northeast of Structures 1, 2 and 4. The area between Structures 1 and 4 seems to contain a lot of bone refuse. This may also have been the dumping area between structures.

Squirrel: Two species of squirrel are potentially represented in this faunal assemblage, the elements of which are tabulated by cultural period (see Table II-3). The most obvious observation about

the squirrel remains was that they were mostly broken; there were few complete long bones. It is suggested that these bones were intentionally broken during or before cooking. All body parts appear to be represented in the samples, and although the sample sizes are relatively small, there were no significant differences found.

There is a difference between the Baytown and Late Baytown samples significant at less than the .10 level and is a result of differences in the concentration of skull and tooth fragments and less postcranial elements in the Late Baytown sample. The samples were compared using the Kolomogrov-Smirnov two sample test (Siegel 1956). Squirrel remains were plotted across the site and again exhibited the same distribution as deer, concentrating to the northeast of Structures 1, 2, and 4.

Rabbit: The eastern cottontail and the swamp rabbit probably occurred in the vicinity of the Little Cypress Bayou site. Rabbit is the third most common mammal used as a food source. The small sample sizes of this animal really preclude any comment other than it was taken for meat and skins. The proportions of skull to meat to foot elements between the samples in Table II-4 are nearly equal for Baytown as Late Baytown while Mississippian is dominated by skull fragments. It is interesting to note that the distribution of rabbit remains is primarily restricted to the northeast of Structure 1 and the east of Structure 4.

Birds

The avian sample (Table II-5) from this site is rather small and lacking in any diversity. This is rather interesting considering the site's location; waterfowl would be expected, especially if the site was occupied during the spring and fall migrations. But, although waterfowl are second in number to passerines, their frequencies were not particularly noteworthy. Turkey is represented very incidentally, another surprise since it is often a major food item, following behind deer and raccoon in importance for meat.

Fish

The assemblage of fish (Table II-6) represented in these samples would typically be encountered in a smaller stream or backwater pond on the Mississippi River floodplain. Many of the indeterminate fish vertebrae were less than two millimeters in diameter. This small average size of the fish combined with the presence of the madtom (*Noturus*) and minnows suggest either the use of a fine mesh seine or a harvesting techniques similar to that proposed by Limp and Reidhead (1979). The relative small size of all of the catfish/bullheads based on cleithrum less than one centimeter in length and small pectoral spine can be interpreted as probably a late summer to fall harvesting.

TABLE II-5. FREQUENCIES AND PERCENTAGES OF BIRD REMAINS BY CHRONOLOGICAL COMPONENT.

	BAYTOWN		LATE BAYTOWN		MISSISSIPPIAN/ BAYTOWN		MISSISSIPPIAN		INDETERMINATE		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Goose sp.							1	.97			1	.27
cf. Goose sp.	1	.70			1	2.0					2	.54
Duck (cf. _Aythya_ sp.)							2	1.94			2	.54
Duck (medium sized)					2	4.0	1	.97			3	.82
Duck sp.	6	4.20			3	6.0	6	5.83			15	4.08
Hawk sp.	2	1.40									2	.54
Turkey (_Melcagris galloparo_)	1	.70									1	.27
cf. Turkey (_Melcagris galloparo_)			2	3.51							2	.54
Passerine sp.	14	9.79	7	12.28	4	4.0	6	5.83			31	8.42
Indeterminate bird bone	119	83.22	48	84.21	40	80.0	87	84.47	15	100.0	309	83.97
Total	143		57		50		103		15		368	

TABLE II-6. FREQUENCIES AND PERCENTAGES OF FISH REMAINS BY CHRONOLOGICAL COMPONENT.

	BAYTOWN		LATE BAYTOWN		MISSISSIPPIAN/ BAYTOWN		MISSISSIPPIAN		INDETERMINATE		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
cf. Spotted gar (Lepisosteus)					2	.19					2	.01
Gar (Lepisosteus sp.)	69	1.28	37	1.28	34	3.29	37	.96	9	1.38	186	1.34
Bowfin (Amia calva)	110	2.04	85	2.94	38	3.68	95	2.46	25	3.82	353	2.55
Minnow (Cyprinidae)	4	.07	2	.07							6	.04
cf. Buffalo (Ictiobus sp.)			1	.03							1	.01
Sucker (Castostomidae)	1	.02					1	.03			2	.01
Channel/Blue catfish (Ictalurus sp.)	7	.13	2	.07							9	.07
cf. Channel/Blue catfish (Ictalurus sp.)	2	.04					3	.09	2	.31	7	.05
Bullhead (Ictalurus sp.)	4	.07	1	.03			37	.96	1	.15	43	.31
Catfish (Ictalurus sp.)	45	.83	15	.52	37	3.58	46	1.19	5	.76	148	1.07
Madtom (Noturus sp.)							1	.03			1	.01
cf. Madtom (Noturus sp.)	1	.02									1	.01
Bass (Micropterus sp.)	4	.07	1	.03	3	.29	1	.03			9	.07
cf. Bass (Micropterus sp.)							1	.03			1	.01
cf. Bluegill (Lepomis machrochirus)	1	.02									1	.01
cf. Sunfish (Lepomis sp.)	2	.04	1	.03							3	.02
Sunfish/Bass (Centrarchidae)	15	.28	1	.03	1	.10	9	.23	1	.15	27	.20
Freshwater Drum (Aplodinotus grunnions)	22	.41	7	.24	4	.39	7	.18	1	.15	41	.30
cf. Freshwater Drum (Aplodinotus grunnions)									2	.31	2	.01
Indeterminate fish scales	565	10.50	373	12.89	31	3.0	591	15.29	169	25.84	1729	12.49
Indeterminate fish bone	4544	84.21	2367	81.82	883	85.5	3036	78.60	439	67.13	11,269	81.42
Total	5396		2893		1033		3865		654		13,841	

Burial Associations

Contents of the features which contained human burials are examined in an effort to identify burial accoutrements and possibly food offerings. There were four burials (Features 650, 654, 788, 905).

Burial 1 (Feature 650) is an adult male aged 30-35 years with a cultural affiliation of possible early Mississippian (Rose et al., this volume). There were no bone or shell artifacts associated with this individual and none of the faunal remains recovered from the burial fill were of any significance (see Appendix I).

Burial 2 (Feature 905) is an adult female 22-24 years of age who suffered from spina bifida and was carrying a seven month fetus at the time of death (Rose et al., this volume). This is a burial dated to A.D. 980. A hawk claw was identified in this burial which may be seen as a possible amulet. Likewise, the three passerine elements may represent a single individual bird skin worn or carried by this woman. There were three deer elements associated with this burial, one was worked. Although they are not from prime meat bearing sections of the animal they may have been actively place with the burial and not part of the burial pit fill. Based on the ecology of the land snails associated with this burial, it is suggested that the body was either covered by wood or that the burial pit was open for a time. The snails are found in or under rotting wood in moist/damp conditions, especially Helicodiscus (see Hubricht 1985). The availability of rotting wood and a moist protected area and an available source of calcium (bone and shell) would have been attractive to these forest snails.

Another interesting aspect about this burial (Feature 905) is the quantity and variety of faunal remains. The collection from Burial 2 was far more extensive than any found in the fill of the other three. It has been suggested (Chapter Five, Volume I) that the inclusion of such an array of faunal species might indicate preferential treatment or special offerings given this woman who was seven months pregnant at the time of death.

Burial 3 (Feature 654) was determined to be a 12 year old child (Rose, this report). This burial was associated with indeterminate Mississippian age cultural materials but has been radiocarbon dated at approximately 1000 A.D. The analysis of the carbon 12/13 isotope ratios indicate that the individual in this burial had a high consumption of maize before death. This level of maize consumption in an early Mississippian context might be construed as a privileged or status individual. There was only a single bone artifact associated with this burial and the rest of the faunal remains are not noteworthy [see Appendix I] (see Bogan 1980, 1983 for discussion of food items and artifacts with status burials).

Burial 4 (Feature 788) was a fragmentary adult from an indeterminate Mississippian cultural association. There is nothing remarkable about the faunal materials recovered from the burial pit fill (see Appendix I).

Seasonality

No strong indications of seasonality were recognized in the total faunal sample. The overall composition of the sample is quite similar to that Carr (1982) describes for Powell Canal: spring/early summer. It is interesting that in both of the faunal samples that migratory waterfowl contribute a very small part of the diversity, pointing to a period of occupation not coinciding with the major waterfowl migration. Supporting evidence for a summer occupation would be the timing of fishing backwater lakes when they contained their highest biomass: early summer (e.g. Limp and Reidhead 1979; Yerkes 1981).

Other Sites in the Area

A major problem in comparing the faunal remains from 3CT50 with other faunal samples in the Middle Mississippi River Valley is the differential recovery techniques employed. The faunal samples discussed by Bruce Smith (1975) were either recovered with a 1/4 inch mesh screen or collected by shovel sort. Brougham Lake (Bogan 1983), Berry Cemetery (Bogan 1983), Armorel (Bogan 1974), Zebree (Guilday and Parmalee 1975; Roth 1980), Powell Canal (Carr 1982) faunal samples were recovered either by flotation or fine mesh screening. Still some comparisons can be made through an examination of these site collections.

Armorel (Bogan 1974) was a Nodena phase village overlying a Baytown occupation on the east bank of an old oxbow lake. There were 50,000+ bones and bone fragments in the Armorel faunal sample and 100+ vertebrate taxa identified. Very few deer remains were identified in the Armorel collection which was instead dominated by aquatic species: ducks, geese, turtles and fish. The terrestrial vertebrates are dominated by rabbit and squirrel remains.

The faunal sample recovered from Berry Cemetery (Bogan 1983) was poorly preserved and only documents the use of species by the site's inhabitants. However, the importance of fish in the collection was clearly underscored.

Carr (1982) discussed the faunal remains recovered from Powell Canal, a Baytown occupation in southeastern Arkansas on Bayou Macon. She attributed the occupation to spring/early summer, observing that the occupation was probably seasonal to take advantage of aquatic resources. Carr (1982) lists deer elements found on the site but unfortunately does not tabulate the remains by element because the site was too small. The total number of identified faunal remains from Powell Canal was 4898 pieces, of which over 90 percent was fish; 65 deer fragments comprised just a little over one percent of the Powell Canal faunal collection. Again, this clearly documents a heavy reliance on aquatic resources. The deer, although providing a large quantity of meat per individual appears to have been a less frequent part of the overall meat portion of the diet.

Faunal remains recovered from excavations at Zebree have been reported by Guilday and Parmalee (1975) and Roth (1980). Occupations at this site, located in the north end of the Big Lake Wildlife Refuge in northeastern Arkansas, were Baytown and Mississippian. Guilday and Parmalee (1975) noted that 57 percent of all species identified were aquatic and observed that turkey remains at Zebree were only a minimal part of the sample as opposed to other sites which reflected upland hunting. Fish remains comprised 66 percent of the bones and 32 percent of the individuals Guilday and Parmalee (1975) identified. The patterns presented by Roth (1980) for the Baytown indicate the importance of the fish and aquatic birds. They also commented on the decided hunting bias toward aquatic birds over the eight deer recovered from the site; interestingly, the raccoon is as common as deer in number of elements and turkey is absent. The Mississippian fauna as presented by Roth (1980) for Zebree has deer as the most common mammal, but, again, a heavy reliance on aquatic resources is suggested for this component as well.

The Brougham Lake site, located on the east bank of Brougham Lake near the confluence with Gibson Bayou in Crittenden County (Klinger et al. 1983), produced a faunal sample that was dominated by mammal remains (93.99 percent). Reptiles represented 2.37 percent and fish comprised 2.36 percent. However, this sample must be viewed as preliminary and not definitive. Vertebrate remains from Brougham Lake site were poorly preserved and consisted primarily of charred or calcined fragments. Consequently, comparative interpretations must be made with caution.

Summary

The faunal sample from 3CT50 supplies further data on Baytown and Mississippian faunal exploitation in the Central Valley where there has been a tendency to try and fit the data into patterns observed for adjacent areas of the midwest. To summarize the Central Valley data, we also have to consider reliability and comparability. For example, data used by Smith (1975) may be questioned as appropriate for comparison with small hamlets on two counts; major village sites and non-comparable recovery techniques. Faunal samples from Brougham Lake and Berry Cemetery must be seriously questioned due to poor preservation. This leaves Zebree and Powell Canal and the test excavation at Armorel.

The samples from Zebree and Armorel underscore a heavy reliance on aquatic waterfowl, turtles and fish. The migratory waterfowl at both sites contributed significantly to the diversity of the fauna used. However, at Armorel, deer were not as well represented as they were at Zebree. These two samples stand in contrast with 3CT50 in their abundance of waterfowl, but agree in the variety of turtles and fish. Also, turkey is poorly represented at all three sites. In contrast, Powell Canal compares very closely with 3CT50.

The faunal sample from 3CT50 is important because it is now possible to question the patterns of faunal exploitation in the Middle

Mississippi River Valley. The explanations typically presented center around a heavy use of deer, waterfowl and aquatic resources.

Faunal samples from 3CT50 and Powell Canal, however, shed new light on these explanations and point to important directions for research. Deer remains are few in number and need to be tabulated by element to illustrate intra-site patterns and the implications of hunting, butchering and possibly tribute. Rabbit and squirrel remains should be carefully tabulated because they may be replacing some of the waterfowl and deer used at other sites. The faunal samples from 3CT50 and Powell Canal present a different picture of faunal resource exploitation for the Mississippi River floodplain than that conceived by Smith (1975) based on major village sites. The variation may result from several factors. For example, was there already trade of deer in Baytown times or the payment of tribute to local centers of political or religious powers? Payment of tribute in terms of deer parts would fit with a model of a developing ranked society (e.g. Bogan 1980, 1983). This might also explain some of the anomalous amounts of turkey and deer in sites like Powell Canal and 3CT50 other than the animals were not locally available.

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APPENDIX III

MACRO PALEOBOTANICAL ANALYSIS

by
Andrea Shea

The analysis of the macro-botanical samples, recovered primarily from features, focused on resolving the question of whether or not floral domesticates were being utilized by any of the occupants at 3CT50. Of secondary importance was the determination of the range of floral species exploited during the various occupations of the site.

The majority of samples analyzed were recovered in the field as flotation samples from either features or control blocks within excavation units. A small minority of the samples were taken during the normal processing of fill.

The following discussion has been ordered into three major sections: 1) explanation of laboratory procedures; 2) results of analyses; and 3) interpretations.

Laboratory Analysis

Flotation Procedures

Prior to receipt of the samples, all flotation had been completed at NWR. The flotation samples from features and control blocks were initially subjected to a clean water float, and floated materials captured through the use of three screens: 1/4 in, 1/8 in and 1/32 in copper window screen mesh. Materials recovered from each screening were wrapped separately and the three bagged by provenience designation. If no botanical remains were recovered on any of the screens, or on particular screens, that information was recorded on the provenience record sheet which was submitted with the processed samples.

As noted previously throughout various sections of the 3CT50 report and appendices, many of the features which were initially identified after the Phase I stripping were subsequently determined to be natural occurrences. These feature numbers were voided in the field. Therefore, the selection of feature contents that were subjected to flotation was greatly reduced from the initial number of features identified during Phase I. From the reduced number, the features selected for flotation were those with the least natural or cultural disturbance.

Despite these rounds of elimination, however, the total number of features was still greater than had been anticipated. Therefore, the senior author, in conjunction with the principal investigator (Altschul) selected a representative sample of all feature classes; the materials recovered from the flotation of these features were subjected to a complete analysis. The remaining features yielding ethnobotanical materials were subjected to a more abbreviated procedure which involved the cursory examination of the feature contents to determine only the presence or absence of seeds and fruits.

Those feature contents subjected to detailed analyses were initially sieved through a graduated series of geologic screens, 2.00 mm, 1.0 mm, and 250 microns. The contents of each screen were examined with a variable power binocular microscope with a power range of 7x to 30x. The contents of the 2.0 mm screen were sorted and quantified by gram weight and fragment numbers. The material remaining in the 1.0 mm and 250 micron screens consisted of seeds, fruits, wood charcoal, tubers, and unidentifiable nutshell and was categorized as Residual. The seed and fruit remains and other recognizable material were removed from the screens for identification.

RESULTS OF ANALYSES

The analyses resulted in the identification of some 37 plant genus or species. Table III-1 presents a complete listing of the scientific and common names for all identified specimens. Certain of the materials could not be identified to either the genus or species level; these are classified on Table III-2 as residual materials. As noted previously this category included very fragmentary and unidentifiable seeds, fruits, wood charcoal, tubers and nutshell.

The identified species can be broken down into two principal classes: 1) foodstuffs; and 2) woods. The former has been divided into three sub-classes which include native wild plants, exploited as food resources or for usable materials; potential domesticates; and domesticates. Species included in the second class are the various woods which were recovered either as charcoal or from features such as postmolds. The woods were presumably used as building materials or fuel.

TABLE III-1. SCIENTIFIC NOMENCLATURE OF FLORA REPRESENTED IN 3CT50 ETHNOBOTANICAL SAMPLE.

Scientific	Common
Acer sp.	Maple
Arundinaria gigantea	Cane
Asteraceae	Composite Family
Carya sp.	Hickory
Celtis sp.	Hackberry or Sugarberry
Chenopodium sp.	Chenopod
Crataegus sp.	Hawthorn
Curcurbita sp.	Pumpkin or Squash
Diospyros virginiana	Persimmon
Fabaceae	Bean Family
Fraxinus pennsylvanica	Green Ash
Gleditsia triacanthos or aquatica	Honey Locust
Helianthus annuus	Sunflower
Ilex sp.	Holly
Iva annua	Sumpweed
Juglans sp.	Walnut/Butternut
Lagenaria siceraria	Gourd
Liquidambar styraciflua	Sweetgum
Maclura pomifera	Osage Orange
Phalaris caroliniana	Maygrass
Phaseolus vulgaris	Bean
Phytolacca americana	Pokeweed
Platanus occidentalis	Sycamore
Poaceae	Grass Family
Polygonum sp.	Smartweed
Prunus sp.	Cherry
Quercus sp.	Red Oak Group
Quercus sp.	White Oak Group
Quercus sp.	Oak
Rhus sp.	Sumac
Rubus sp.	Blackberry
Salix sp.	Willow
Taxodium distichum	Bald Cypress
Ulmus sp.	Elm
Vicia sp.	Vetch
Vitis sp.	Grape, grapevine
Zea mays	Maize

TABLE III-2. RESIDUAL AND TOTAL WEIGHTS OF FLORAL REMAINS RECOVERED FROM QUANTIFIED PROVENIENCES AT 3CT50.

Feature	Level	Residual Grams	Total Grams
8	L-6	.2	.7
13		.1	.15
21		.09	.09
28	Sg-A	.9	3.1
29		5.54	10.78
29	L-A	2.72	8.34
29	L-B	1.35	4.23
50		4.0	6.42
50	L-2	9.4	19.32
90		4.13	8.15
90	Sg-A	7.7	15.66
199		4.23	9.46
212		4.51	7.13
226		.07	.07
257		1.0	1.91
267		1.2	4.07
269		3.25	6.09
280		.6	.99
282		26.53	45.06
290		2.3	5.57
295		9.0	24.56
295	St-A	30.8	73.4
299		2.17	5.59
302	L-B	1.2	2.6
306		3.0	6.68
324		.1	1.1
330		18.1	31.29
331		6.82	13.52
331	St-A	6.96	8.21
332		.29	4.4
334		.1	.8
342		8.38	12.78
345		1.0	2.57
351		8.64	56.69
376		8.2	14.8
376	St-A	2.6	6.32
380		8.6	25.01
403		1.72	8.06
413		11.70	31.89
420		.18	.33
428		4.0	16.80
433		9.85	15.2
640		.73	6.62
656		5.6	12.21
659	St-A	5.4	11.71
659	St-E	2.1	2.6
659		11.58	33.95
672		.1	.31
675		.4	.4
680		.1	.11
683		.43	2.16
684		2.5	8.59
691		.5	1.25
698		1.0	2.0
700		.28	.73
702		.5	1.66
729		23.9	44.97
735		.9	4.18
746		3.0	8.33
Test Pit	Level		
9	L-12C	1.0	5.01
10	L9/StII	.2	.5

Known and Possible Foodstuffs

Native Wild Plants

Several species, including persimmon, sumac and honey locust, are considered to have been economically important during both prehistoric and historic times. Researchers such as Steyermark (1956), Swanton (1946, 1952) and Hudson (1976) have documented the use of these species for both their fruits and seeds (as foodstuffs, or for technological purposes) and for their other plant parts. The summaries of the wild plant species identified at 3CT50 are presented below; for the most part, the data on habitat and seasonal availability have been taken from Steyermark (1963) unless otherwise noted. Table III-3 quantifies the whole and fragmentary seeds and fruits of plant species recovered from the quantified features.

Wild Bean (Fabaceae): Seventeen whole and 17 seed fragments were recovered from 17 features. Many species would have been growing near the site in disturbed habitats. The pods and seeds of several species can be used for food and are available from summer through autumn (Fernald and Kinsey 1943).

Blackberry (Rubus sp.): One whole seed was recovered from one feature. Several species would have been available in a variety of habitats. The fleshy fruits are edible and are available from June through July.

Composite Family (Asteraceae): Four fragments of seedheads were recovered from four features. Members of this family have medicinal value; the flowerheads and leaves can be used to make a tea (Coon 1974). The species grow in a variety of habitats, particularly disturbed areas. The seedheads ripen from July through November.

Grape (Vitis sp.): Four whole and nine seed fragments were recovered from 11 features. Several species of grape would have been found in a variety of habitats near the sit. These include summer, sweet winter, red, river bank, sand, and muscadine or Scuppernong grapes. These are all edible and are available from August through December.

Grass Family (Poaceae): A total of 12 whole and two seed fragments was recovered from 12 features. Some members of this family have edible grains. The seeds can be parched or ground into meal or cooked into soups. Other parts of the plants can be used for mats, screens, arrow shafts and thatching (Coon 1974). Grasses grow in a variety of habitats and are available from June through December.

Hawthorn (Crataegus sp.): Two whole seeds were recovered from one feature. Several species would have been available near the site. The fruits have a fleshy, edible pulp and ripen from August through October.

TABLE III-3. QUANTIFICATION OF SEEDS AND FRUITS, NATIVE WILD PLANTS.
(Page 1 of 3)

	28	29	29 L-A	29 L-B	50	50 L-1	56	61	78	81	86	86A	102 L-2	113	114	127	138	204	269	282	284	285	290	295	299 L-A	300
Bean, Wild																										
whole					2														2							
fragment		1										6														
Blackberry																										
Composite fragment						1					1									1						
Grape																										
whole				1																						
fragment								1																2		
Grass																										
whole	1					1		1																		
fragment																										
Hawthorn																			2							
Honey Locust																										
whole																										
fragment							1																			
Persimmon																										
whole									1										1				1			
fragment		1								1	2		1	1			5				1	1	5			1
Pokeweed fragment																		1								
Sumac																										
Vetch																										
Unknown																										
whole			1												1											
fragment																3									1	

TABLE III-3. QUANTIFICATION OF SEEDS AND FRUITS, NATIVE WILD PLANTS.
(Page 2 of 3)

	306	306 L-A	306 L-C	317	318 L-A	324	325	327	327 L-2	330	331	342	351	357	365	376	376 St-A	380	407	409	410	411	413	414
Bean, Wild																								
whole		1									6			1				1						
fragment					1								3											
Blackberry																								
Composite fragment																								
Grape																								
whole						1		1											1					
fragment					1												1	1						
Grass																								
whole	1																							
fragment																								
Hawthorn																								
Honey Locust																								
whole				6																				
fragment																3	3			1	2	1		
Persimmon																								
whole																								
fragment			1		1			2	1	8		1	1		1	3	5						4	2
Pokeweed fragment																								
Sumac																								
Vetch																								
Unknown																								
whole											1													
fragment							2																	

TABLE III-3. QUANTIFICATION OF SEEDS AND FRUITS, NATIVE WILD PLANTS.
(Page 3 of 3)

	419 L-A	427	429	430	433	635	640	650	656	658	659 St-A	660	702	719	729	736	747	760	769	903	905	1003	TP 9 L-12C	TP 23 L-5B
Bean, Wild																								
whole														1		1		1				1		
fragment												1										2		
Blackberry															1									
Composite																								
fragment									1															
Grape																								
whole							3																	
fragment											1													
Grass																								
whole								1		2	1													1
fragment																	1							
Hawthorn																								
Honey Locust																								
whole									1															
fragment				1					3															
Persimmon																								
whole									1															
fragment		1	1	2	3	1			4	2		1	4		16				1	1		1		
Pokeweed																								
fragment																								
Sumac	1													1							1			
Vetch																								
Unknown																								
whole									1														1	
fragment																								

Honey Locust (Gleditsia triacanthos or aquatica): Nine features yielded one whole and 19 fragments of honey locust seeds. The pod contains a pulp which has a sweet flavor used for a beverage or a sweetner (Fernald and Kinsey 1943). Honey locust is a bottomland species, and the fruit (pod) ripens in September and October and may remain on the trees throughout the winter.

Persimmon (Diospyros virginiana): A total of four whole and 92 seed fragments was recovered from 43 features. Hudson (1976) states that persimmon fruit was one of the most important fruits used by the southeastern Indians. The fruits were used aboriginally for puddings, breads, pies, cakes, and were eaten fresh or dried (Swanton 1946). The seeds can be roasted for a coffee-like beverage and the leaves can be used for a tea (Fernald and Kinsey 1943). The fruit ripen after the first frost, usually in November, and are available through the winter. The trees grow on floodplains and alluvial terraces.

Pokeweed (Phytolacca americana): One seed fragment was recovered from one feature. Pokeweed grows in disturbed areas and was probably growing on or near the site; therefore, this occurrence could be an accidental inclusion in the feature fill. The berries ripen in July through November and are slightly toxic. The shoots are edible in the spring as greens and the berries have medicinal properties (Coon 1974).

Sumac (Rhus sp.): Three seeds were recovered from three features. The fruit of sumac can be used for a beverage, for a dye, or for medical purposes. The fruits can be dried and stored for winter use (Fernald and Kinsey 1943). The "Indians" smoked the leaves with tobacco (Coon 1974). Three species of Rhus would have been growing near the site in a variety of habitats: disturbed areas, dry woods, uplands, etc. The fruits are available from June through December.

Vetch (Vicia sp.): One whole seed was recovered from one feature. The seed pods are used as an emergency food and are indigestible and not palatable (Fernald and Kinsey 1943). The pods are available from May through September.

Nuts

While the plant species noted above certainly played a role in the subsistence pattern and life modes of the native inhabitants of the site, all data suggest that the most critical of the wild plant species exploited were the various nut-bearing trees. Based on sheer weight, 99.4 percent of weighed plant remains were either nut shell fragments or meats. Seeds of various other plant species represented only .6 percent of weight, and the combined weight of domesticates (including beans, maize and squash) was less than .1 percent.

A short discussion of the various nut types is presented below.

Hickory (Carya sp.): Table III-4 presents a summary of all nut remains recovered from various features and proveniences. It will be clearly noted that hickory represented the clear majority of these remains (by weight, 88.1 percent).

Some 139.63 gm and over 5257 hickory shell or meat fragments were recovered from the quantified samples. Hickory was readily available in the general project area, and several hickory species were undoubtedly present. The following are the species of Carya that could have been available to the 3CT50 inhabitants [all habitat information is taken from Fowells 1965:111-138]:

Thick-shelled species

C. tomentosa (mockernut) - grows on ridges and hillsides

C. glabra (pignut) - inhabits dry ridges and hillsides

C. ovata (shagbark) - grows in deep, moist alluvial soils, principally river bottoms

C. laciniosa (shellbark) - a bottomland species, grows on river terraces and loamy flats

Thin-shelled species

C. cordiformis (bitternut) - bottomland species

C. aquatica (water hickory) - grows well in alluvium-like soils, also on poorly drained heavy clay flats

Most of the fragments recovered are thick-shelled; only seven thin-shelled fragments (not classed as pecan) were identified in the quantified sample and these could not be classed as to species.

As is well-known, hickory nuts were an important food source among American Indians, and hickory wood was used extensively. The nuts ripen and can be harvested between September and December. Accounts of early explorers (Swanton 1946) suggest that hickory nuts, and other nutmeats were stored, and used later in the winter months (February and March) when supplies of other foodstuffs were low.

The Indians commonly used the hickory nut for its oil; "Hickory milk," the oil excracted from the nuts and recovered by boiling the nuts, was a common additive to other vegetable and meat mixtures. The nutmeat could also be boiled to form a gruel (Swanton 1946).

Pecan (Carya illinoensis): Pecan shell was recovered from 32 features; the features also yielded the remains of other nut foods.

TABLE III-4. NUT REMAINS RECOVERED FROM 3CT50.
(Page 1 of 3)

Feature	Level	Hickory Shell		Pecan Shell		Walnut Shell		Acorn			
		Grams	No.	Grams	No.	Grams	No.	Grams	Cap	S	M
8	L-6A	<.01	1								
10	L-10	<.01	1								
11		.2	12			.06	4	<.01		2	
12	L-7	.05	2								
13		<.01	1								
20		<.01	1					<.01		1	
28	S-A	.21	11			.01	1	.02		5	
29		2.5	145	<.01	2	.02	2	<.01		5	
29	L-A	2.44	143	.11	6	.22	10	.07		12	1
29	L-B	1.06	29			.01	1	<.01	1		
30		.1	9								
50		.8	42			.15	6	.05	9		
50	L-2	.22	17					<.01	2		
68		<.01	2								
90		1.8	91					.12		1	3
90	S-A	6.0	+100	.01	5			.3		16	1
95		<.01	2								
168		.02	2								
169		.01	4								
199		5.2	+100	.01	4			<.01		3	
204		.02	11					.01	1	7	3
212		.69	33	.01	2	.07	1				
215		.4	17					<.01		2	
227		.15	17					<.01		1	
228		.13	12								
257		1.1	64					<.01		2	
259		.5	29			.05	2	<.01		1	
262		<.01	1								
267		1.36	50	.06	3			<.01		1	
269		1.4	100	.02	6	.02	3	.1		12	
272		.2	13								
277		.4	30					<.01		2	
280		.2	30	.01	1	.05	5				
281		.01	2								
282		.21	16			.05	5				
283		<.01	1								
284		.19	8								
289						.05	5				
290		2.1	110	.01	2	.12	3	.01		3	
295		2.6	+200	.05	3			9.2		100+	3
295	St-A	9.41	+200	.1	3	.13	4	1.01		103	3
299		1.16	44	.15	6			<.01		1	
300		.32	13								
302	L-A	.18	3								
302	L-B	.8	44								

S = shell M = meat

TABLE III-4. NUT REMAINS RECOVERED FROM 3CT50.
(Page 2 of 3)

		Hickory Shell		Pecan Shell		Walnut Shell		Acorn			
Feature	Level	Grams	No.	Grams	No.	Grams	No.	Grams	Cap	S	M
306		.32	16								
316		<.01	2								
318	L-A	.1	15	.4	10	<.01	1	<.01		1	
318	L-B	.04	6								
324		1.0	33	<.01	1[a]						
330		3.5	120	.1	7			.02		11	
331		.8	36	<.01	1[a]			<.01		1	
331	St-A	.25	10								
332		2.0	125	<.01	4	<.01	1	.01		12	
334		.2	14								
342		1.5	90	.03	2	.05	2	.01		2	
345		.55	47	.02	5			<.01		2	
351		18.4	+200	.25	22	.32	12	.5		44	7
368		.1	7			.2	3				
375		.13	18								
376		3.7	218			.04	6	<.01		1	
376	St-A	2.3	100					.01		4	
380		3.0	153	<.01	1	.11	5	.02		4	
403		2.7	+100	.01	3	.01	3	<.01		3	
404		.3	60								
413		8.0	+200	.15	14	.25	10	.3		69	
420		.1	9			<.01	5	<.01		1	
428		.1	3					<.01		3	
433		1.71	185	<.01	2	<.01	3	<.01		3	1
596		.8	34	<.01	2						
609		<.01	2								
636		.42	45								
640		5.6	+100			.02	5				
641		.1	6								
642		<.01	1								
650		.38	8			.02	1				
652								<.01		2	
654	S-1	.02	6					<.01		2	
656		2.09	112	.01	2			.2		44	
659	St-A	2.0	105	<.01	1			.01		7	
659	St-E	<.01	2					<.01		5	
659		2.42	+103	<.01	2	.1	4	.15		11	1
662		.1	9								
665		.19	45	<.01	2	<.01	1	<.01		1	
667		.1	13								
668						.2	2				
669		.01	3								
672		.2	12					<.01		1	
673		<.01	2								
675		<.01	1								

[a]bitternut hickory

TABLE III-4. NUT REMAINS RECOVERED FROM 3CT50.
(Page 3 of 3)

Feature	Level	Hickory Shell Grams	Hickory Shell No.	Pecan Shell Grams	Pecan Shell No.	Walnut Shell Grams	Walnut Shell No.	Acorn Grams	Acorn Cap	Acorn S	Acorn M
676		.2	16								
680		.01	6								
683		.4	16			.03	3	<.01		3	
684		2.4	130	.05	7	.27	8	.08		5	1
684B		.2	10			.01	2				
688		<.01	1			.02	3				
691		.05	40								
692		.1	3			.02	3				
698		.3	20			<.01	2				
700		.1	3			.1	5	<.01		1	
702		.36	28			.18	5	<.01		1	
729		6.5	+177	.9	7	.32	19	.41	25	5	
735		3.1	+100	.05	3	.13	4	<.01		1	
739		.15	15			.01	1				
740		.3	6								
743		.7	37								
746		3.9	+100	.02	2			.01		8	
748		.05	4					<.01		2	
751		.01	1								
763		<.01	2								
777		.3	13								
789		.1	3	<.01	1						
790		.76	30					.1		11	
793		.1	12								
796		.12	5					<.01		1	
798		.02	3			.01	3				
799		.22	33					<.01		1	
800		.01	5								
810		.1	11			.03	3	<.01		1	
812		.5	38					<.01		1	
818		.07	5								
838		.1	13								
839		.01	4								
843		.05	8								
1003		.1	6								
Test Pit	**Level**										
9	L-12	.4	2					<.01		1	
9	L-12C	.03	4								
9	St-II	.05	3								
9	St-III	<.01	1								
10	L-3	<.01	1								
10	L-5/6	<.01	1								
10	L9/StII	.05	2								
12	L-1/2										
Block 1 N183/E297	L-2	.1	8								

Somewhat surprisingly, pecan represented only 1.1 percent of the possible food remains recovered; its low incidence in the 3CT50 deposits is not completely understood, as the pecan tree is common in the area and grows well in river-bottom soils.

The native uses of pecan are not exceptionally well-documented, as most accounts classify the pecan with the other members of its genus, hickory. Nonetheless, pecan meat is known to have been eaten and used, like hickory, for its oil. Additionally, both the bark and the leaves of the pecan tree can be utilized to make a mild astringent (Vines 1977:45).

Walnut (*Juglans sp.*): Walnut shell constitutes 2.2 percent of the plant food weight with 180 fragments recovered from the quantified samples. The natural distribution of *Juglans nigra*, which grows best on well-drained moist soils and fertile alluvial deposits, extends south into Arkansas and Louisiana *except* for the Mississippi Valley and Delta regions. There is a spur extending down the Mississippi Valley, a higher elevation area, Crowley's Ridge, in which black walnut does occur. It is possible that walnuts were collected from this area and brought to the site, or that walnut trees did occur sporadically in close proximity to the site in the past.

The nuts can be stored and could have been easily transported. The quantity of shell recovered does indicate a role in the aboriginal diet of the 3CT50 inhabitants. Again, as with pecan and hickory, the fruit ripens in September and October; most ethnographic accounts suggest that the nuts were stored for later use in addition to the use for oils and meats.

Oak (*Quercus sp.*): Acorn meat and shell comprise 8.1 percent of the total plant food remains. Recovered from the samples were 620 shell fragments, 29 meat fragments and one cap fragment. The nuts (meats) can be ground or pounded in the same manner as hickory nuts to extract the oil (Swanton 1946:273-366).

Two principal types of oak, white and red, are found in general proximity to the project area. The white oaks have a sweet and palatable nut; whereas, the red oak acorns are usually bitter. The meat of the red oak acorns must first be leached or parched to remove the tannic acid. The following are species of *Quercus* which could have occurred in the area of the site in the past. The habitat information is taken from Fowells (1965).

White oaks

Q. *alba* (white oak) - grows on all sites; fruit available in September and October.

Q. *lyrata* (overcup) - bottomland species found on first bottomlands and terraces; first available September to October.

White oaks (continued)

Q. michauxii (swamp chestnut oak) - well-drained, silty, clay and loamy terraces and colluvial sites in bottomlands; fruit ripens

Red oaks

Q. falcata var. pagodaefolia (cherrybark) - first bottoms and well drained terraces and colluvial sites; fruit ripens and falls September-November

Q. nuttallii (nuttall) - grows on poorly drained alluvial clay soils in the first bottoms of the Mississippi Delta region; found on clay ridges in the first bottoms; available September-February.

Q. palustris (pin oak) - grows on bottomland soils, good growth on wet sites, can withstand periodic flooding; fruit ripens September - November.

Q. nigra (water) - occurs on bottomland soils, alluvial bottoms, better drained, silty clay or loamy ridges; fruit mature August-October.

Q. phellos (willow) - grows on alluvial soils; fruit matures August-October.

Potential Domesticates

Sunflower (Helianthus annuus): Three whole sunflower achenes were recovered from three features 29, 427 and 656 (Table III-5). Seven other features yielded the remains of fragmented achenes (Table III-6). The following are the measurements of the sunflower achenes.

TABLE III-5. SUNFLOWER ACHENE MEASUREMENTS (in millimeters).

Feature	Actual Dimensions		Reconstructed Dimensions	
	Length	Width	Length	Width
29	7.5	3.0	8.3	3.9
427	5.0	2.0	5.5	2.5
656	5.0	2.0	5.5	2.5

TABLE III-6. QUANTIFICATION OF POTENTIAL CULTIGENS RECOVERED FROM 3CT50.
(Page 1 of 2)

Feature	Level	Sunflower		Sumpweed		Maygrass		Chenopod		Smartweed	
		W	F	W	F	W	F	W	F	W	F
11						6					
12	L-7					1					
13						1					
27						1					
28	Sg-A					2		2			
29		1				7	3				
29	L-A	1				1		4		2	
29	L-B					1		1		1	
50	L-1					11	5				1
50	L-2					2					
61						16	10				
78						16		2		1	
81						3					
86						1					
90						1	1			1	
92						2					
93A						3					3
94	St-B					9	6				
102	L-3					3					
199			1								
269						4	1	5		1	
281						3					
282						4				1	
285						2	3				
294				1							
295			1			9					
299	L-A					5					
302						2	1	2			
306						7					
306	L-AN					1				1	
314	L-B					1					
317						1					
318						1					
318	L-A			1							
318	L-B					13					
324						1					
325				1		1					
327	L-2		1								
330						1					
331						1					
331	St-A					5					
332						2					
342						5		1			
368						1				1	

W = Whole F = Fragment

TABLE III-6. QUANTIFICATION OF POTENTIAL CULTIGENS RECOVERED FROM 3CT50.
(Page 2 of 2)

Feature	Level	Sunflower		Sumpweed		Maygrass		Chenopod		Smartweed	
		W	F	W	F	W	F	W	F	W	F
376						4					1
376	St-A					3					
380						2					
408						3					
409						1				1	
413						24					2
414						1					
415						1					
419	L-B					1					1
427		1	2								
428						12					
433						5					
610						2					
640				1		6	3				
642						1					
650						1					
654						2					
656		1	1			38				1	
658				1		3					
659				1		1					
659	St-A					12					
660						3					
665						28					
680						1					
683						1					
684						6					
691						5					
692							1				
698						2					
719						9					
729			2			37					
736						2					
745						15					
746						1					
747				1		5					
758						2					
760			17			352		541			
762										1	
774						3					
775						14					
811						2					
812						5					
837						2					
903						1					
1003						3					
TP23	L-5					7					

Richard Yarnell (personal communication) has determined a reconstruction factor of 1.11 x 1.27 for the carbonized achenes based upon an approximate 11 percent shrinkage factor. Yarnell (1977) states that archaeological evidence indicates the cultivation of sunflower and sumpweed (Iva) began about 3,000 years ago in the southern Midwest (Kentucky and Tennessee to Missouri). A gradual increase in the size of achenes, as a result of domestication, is indicated by archaeological remains from Archaic to Mississippian periods. The size of the achene from Feature 29 falls within the range of achenes from Late Woodland and Mississippian sites (Yarnell 1977). The achenes from Features 427 and 656 are smaller and may date earlier or be immature achenes.

Sumpweed (Iva annua): There is archaeological evidence for the cultivation of Iva annua and, as mentioned above, an increase in the size of achenes through time (Yarnell 1977). Table III-7 presents the measurements of the eight sumpweed seeds recovered from eight features.

TABLE III-7. DIMENSIONS OF IVA (SUMPWEED) SEEDS (in millimeters).

FEATURE	ACTUAL DIMENSIONS Length	Width	RECONSTRUCTED ACHENE Length	Width
294	1.2	1.2	2.1	1.8
318	1.0	1.0	1.9	1.5
325	1.0	1.0	1.9	1.5
640	1.3	1.0	2.2	1.5
658	1.0	1.0	1.9	1.5
659	0.5	0.5	1.3	1.0
747	1.0	1.0	1.9	1.5
812	0.5	0.5	1.3	1.0

Yarnell has determined that the carbonized seeds are smaller than the carbonized achenes by approximately 0.7 mm in length and 0.4 mm in width. The achenes also shrink approximately 10 percent when subjected to carbonization.

Sumpweed is native to the central Mississippi Delta region and the achenes ripen in October. It grows well in alluvial soils, along streams, river bottoms, prairies and meadows (Steyermark 1963). Yarnell (1977) states, that based on archaeological evidence, the lengths of cultivated sumpweed achenes averaged 3 mm to 4 mm during the early stages of domestication. The dimensions of the achenes from 3CT50 indicate that Iva was utilized, but was probably not yet domesticated.

The following is a discussion of plants to which cultigen status cannot be attributed, but are members of the "Eastern Agricultural Complex." This complex is often referred to in Paleoethnobotanical literature and includes the following taxa: maygrass, chenopodium, pigweed, and knotweed or smartweed (Struever and Vickery 1973; Yarnell 1976). Sunflower and sumpweed are included in this "complex;" but have been previously discussed above. These plants were important to prehistoric subsistence as large numbers of seeds have been recovered from archaeological sites of all periods as well as from human paleofecal remains at salt caves (Yarnell 1974). Yarnell (1976) suggests that these plants could have been "protected" as volunteers in garden plots and grown intentionally with the selection of seeds.

Maygrass [canary grass] (Phalaris caroliniana): A total of 534 whole and 34 fragments of maygrass were recovered from 91 features. Maygrass seeds have been recovered from many archaeological sites in the South and the southeastern United States (Cowan 1978; Shea 1980; Johnson, Robbins and Shea 1983). Ethnographically, La Page du Pratz (1774) describes a grain called "choupichoul" (thought to be maygrass; Yarnell 1977).

> I ought not to omit mentioning here, that from the low lands of Louisiana, the Mississippi has several shoal banks of sand in it, which appear very dry upon the falling of the water, after the inundations. These banks extend more or less in length; some of them half a league, and not without a considerable breadth. I have seen the Natchez, and other Indians, sow a sort of grain, which they called Choupichoul, on these dry sand-banks. This sand received no manner of culture; and the women and children covered the grain any how with their feet, without taking any pains about it. After this sowing, and manner of culture, they waited until autumn, when they gathered a great quantity of the grain. It was prepared like millet, and very good to eat. This plant is what is called Belle Dame Sauvage, which thrives in all countries, but requires a good soil: and whatever good quality the soil in Europe may have, it shoots but a foot and a half high; and yet, on this sand of the Mississippi, it rises, without any culture, three feet and a half, and four feet high.

Maygrass seeds or grains are available from June to July and the plant occurs in sandy, open fields, moist ground and disturbed areas. Because of the large number of seeds recovered from 3CT50, maygrass is considered to have been an important component of the diet of the prehistoric inhabitants.

Chenopod [Goosefoot] (Chenopodium sp.): A total of 560 whole seeds was recovered from 12 features. Most of the seeds, 541 whole, were recovered from Feature 760. The seeds were popped because of the exposure to fire; thus, a species level identification was not

attempted. Chenopod was also probably important as a food source at 3CT50. The greens, available in the spring, would also have been a potential food source. Chenopodium species grow in a variety of habitats, particularly disturbed areas. The seeds are available from August through December.

Smartweed (Polygonum sp.): Fifteen whole and eight fragments of achenes were recovered from 13 features. Smartweed grows in a variety of habitats - wet sites, stream banks and disturbed areas. The achenes ripen from May through frost and the greens can be eaten in the spring. The different species have various shaped achenes. Three features yielded the seeds of Polygonum pensylvanium. These are flattened and heart-shaped. Four features yielded rounded triangular shaped seeds; the remaining features yielded a trigorous, biconvex seed (Radford et al. 1968).

Domesticates

Maize (Zea mays): Maize kernels and cupule fragments were positively identified from five features - 31, 745, 769, 782 and 837 (Table III-8), and were tentatively identified in several others.

TABLE III-8. MEASUREMENTS OF MAIZE REMAINS (in millimeters).

Feature	Sample	Width	Length	Thickness (mm)
31	cupule	4.0	1.0	
745	kernel	4.0		4.0
769	kernel	5.0		4.0
782	kernel	4.0		4.0
837	kernel	fragment		

The kernels are small, but due to the small number recovered, statements cannot be made as to the type of maize represented. The cupule is too eroded to get a definite row number. Eleven other features (Table III-9) contained "possible" maize remains; however, these were badly eroded making a positive identification difficult.

Squash and Gourd (Curcurbita sp.): Squash or pumpkin rind and seed fragments were recovered from nine features, with 10 rind fragments and one seed fragment (Table III-9). Remains of Cucurbitaceae family (squash and gourd) have been recovered archaeologically from the third millenuim B.C. (Chomko and Crawford 1978).

Bean (Phaseslus vulgaris): One feature, 774, yielded the positive remains of a cultivated bean. This cotyledon measured 10 mm in length and 4.0 mm in width. A total of nine fragments recovered from six features can only be identified as "probable" due to their fragmented condition (Table III-9).

TABLE III-9. DOMESTICATED PLANT REMAINS RECOVERED FROM 3CT50.

Feature	Level	Maize Grams	Maize K	Maize C	Squash Grams	Squash No.	Bean W	Bean F
29	L-A				<.01	1g		
31				1w				
56						1r		
208					<.01	1r		
277					<.01	1r		
294			1f					
295	St-A				<.01	1r		
303								1
306			2f			1r		
365						1r		
380		<.01	1?					
404			2f					
419	L-A					2r		
665					<.01	2r		
678		.01	1f					
680		<.01	5f					
745			1w					
769			1w					
			5f					
774								2
782			1w					
811			2f					
812			1f					
833			2f			1s		
837			1f					
Test Pit	**Level**							
12	L-1/2	<.01	1f					
Block 1 N185/E301	L-1		1f					

K = kernel C = cupule W/w = whole F/f = fragmentary
g = gourd r = rind s = seed

Woods and Cane

The wood types represented are presented on Table III-10. Cane (a grass), and grape .ine are included on this list along with 16 genera of woody plants. The sample was obtained by identifying a maximum of 30 fragments from each feature or provenience. The wood fragments recovered could be the remains of firewood, matting, thatching, structural elements, utensils, toys, etc.

In general, the trees represented in the wood charcoal samples could have grown in various habitats near the site at the times of occupation. The bottomland forests, described by Braun (1950), cover most of this area of the alluvial plain of the Mississippi River. The bottomland forest is made up of several forests. The swamp forest consists mainly of cypress and tupelogum (*Nyssa*) and the water is standing throughout the year. The hardwood bottoms are subject to overflow all year, but in the late winter and spring are covered with water. The following species occur in this forest: sweetgums, red maple, elm, sassafras, hackberry, pawpaw, dogwood, green and pumpkin ash, tupelo, swamp chestnut oak, swamp red oak, shingle oak, overcup oak, willow oak and ironwood (*Carpinus*). The ridge bottoms are covered with water only during flooding periods and contain the species of the hardwood bottoms as well as different oaks and hickories. The stream margin communities contain black willow, hackberry, pecan, poplar and sycamore.

As discussed previously, walnut trees do not occur in this area naturally; however, nut remains were recovered as well as charcoal from 12 features. The trees could possibly have occurred in areas near the site in the past, or the nuts and wood may have been collected away from the site area and brought in. The same problem exists with cherry. The wood charcoal was recovered, but the tree *Prunus serotina* does not naturally occur in the area according to range maps. However, there are many species of cherry shrubs that have similar wood anatomy. Some species do occur in the area of the site. Cherry was represented in only four features.

The wood charcoal listed as "conifer" is probably Bald cypress (see Table III-10). Pine does not naturally occur in this area. The range for cedar extends to the margin of this area, but I think the area would have been too wet. However, it is a possibility. There are only slight differences in the minute anatomy of the two species.

Cane would have been extremely plentiful in the area of the site, but it was recovered in only three of the quantified features.

INTERPRETATIONS

Prior to a short discussion of the implications of the ethnobotanical data, some of the problems associated with the interpretation of these remains need to be pointed out. As with other types of

TABLE III-10. NUMBER OF CANE AND WOOD FRAGMENTS RECOVERED FROM 3CT50 FEATURES.
(Page 1 of 5)

Feature	8	9	10	11	12	13	20	28	29	29	29	30	50	50	61	90	90	95	145	146	156	164	165	168	169	174	176
Level	L-6				L-7			S-A		L-A	L-B			L-1			S-A										
IDENTIFIED																											
Ash										1	1				1												2
Cane								1																			
Cedar																											
Cherry																1											
Chestnut																											
Conifer					4	1		1		9				2			2						1				
Cottonwood																											
Elm						2		5		1				1													
Grapevine																											
Grass Stem																						2					
Hackberry																1	1										
Hickory		1		5		2	2	6	5	6	2			2	1	1	9			2							3
Holly																											
Honey Locust						2			3						2												
Maple																											
Mulberry																											
Oak	15				1	3		1				2		6	3	3				1							
Oak, Red	13			6	1	4		20	3	12	13		15				5										
Oak, White	3							1		1	1					1											
Osage Orange						1																					
Persimmon										1																	
Sweetgum								6																			
Sycamore																											
Walnut																											
Willow				1																							
GENERAL																											
Bark													15	15													
Diffuse Porous									2					1													
Shrub Wood																											
Unid. Hardwood	5	2	2			3		5	15	10						10		2	1		1			4	1	2	

L = Level
S = Segment
St = Stratum

TABLE III-10. NUMBER OF CANE AND WOOD FRAGMENTS RECOVERED FROM 3CT50 FEATURES.
(Page 2 of 5)

Feature	199	204	208	212	215	227	228	257	259	262	267	269	272	277	280	282	289	290	295	295	299	300	302	302	306	316	317
Level								L-3												St-A	L-A		L-A	L-B		L-C	
IDENTIFIED																											
Ash				2							1																
Cane																						1					
Cedar																											
Cherry													2														
Chestnut																											
Conifer				1																		1					
Cottonwood																											
Elm												1							1	2					1		2
Grapevine																								1			
Grass Stem																											
Hackberry																											
Hickory		1		2			1	3			1	6			1				5	1	18	1		4	6	2	15
Holly																											
Honey Locust					4						4		2					7		5				3			
Maple					4																				1		1
Mulberry																											
Oak	2			6			3	2		2		13	1					10			1						
Oak, Red		4	2		4						7				5	24	3		11	22		1		2	11		
Oak, White											1								1	1				3			
Osage Orange												1								2							
Persimmon																											
Sweetgum												1				1					1						
Sycamore																				1	1						
Walnut																5		1		2	1		1				
Willow																											
GENERAL																											
Bark																											
Diffuse Porous																									1		
Shrub Wood											2																
Unid. Hardwood		5				3	3		3			8		3	2						8			10	10		

TABLE III-10. NUMBER OF CANE AND WOOD FRAGMENTS RECOVERED FROM 3CT50 FEATURES.
(Page 3 of 5)

Feature	318	318	324	330	331	331	332	334	342	345	351	368	375	376	376	380	403	404	413	417	420	428	433	433	596	609	611
Level	L-A	L-B				St-A									St-A									St-A			
IDENTIFIED																											
Ash				2			2							2			1		3						2	1	
Cane																											
Cedar																											
Cherry					2																						
Chestnut																			4?								
Conifer						3								1	2		1			2				2			
Cottonwood																											
Elm	1			2	1		2		1		5			2	2	1				3					2		
Grapevine																											
Grass Stem																											
Hackberry											1																
Hickory				5		1	5		19	2	9	4	4	9	4	3	3	3	11	3	1		1	5	2		
Holly	10																										
Honey Locust	2			5	3			1		1		1					3	1	3								
Maple				1																							
Mulberry																											
Oak			2		2	4										1		3		4	2	3			3		1
Oak, Red				8	4		3	5	1	6	13			20	12	1	4						2	10			
Oak, White				3	2		5		2	2	1								6					1			
Osage Orange				2							1																
Persimmon																											
Sweetgum																											
Sycamore				1																							
Walnut							1												6	1			1				
Willow				1										1													
GENERAL																											
Bark																											
Diffuse Porous										1			2	1	1		1					27					
Shrub Wood																									1		
Unid. Hardwood		1			15	10	12			5				11	5		17										

TABLE III-10. NUMBER OF CANE AND WOOD FRAGMENTS RECOVERED FROM 3CT50 FEATURES.
(Page 4 of 5)

Feature	636	639	640	641	650	654	656	659	659	659	662	665	667	669	672	673	675	676	677	678	680	683	684	684B	688	691	692
Level						S-1			St-A	St-E																	
IDENTIFIED																											
Ash			1													1				1			2				
Cane																											
Cedar																											
Cherry												1															
Chestnut																											
Conifer						1	1					3				1	1										
Cottonwood																											
Elm							2																				
Grapevine																											
Grass Stem																											
Hackberry			1																								
Hickory		1	5			2	3			1		2					1			1		6	3			1	
Holly																											
Honey Locust		1																								2	
Maple								3								1											
Mulberry																											
Oak	1	1			1			1			2		1		1		1	1	2	1							
Oak, Red						2	4		10													6	5		2	3	1
Oak, White							2		2																		
Osage Orange									2																1		
Persimmon							1																				
Sweetgum																											3
Sycamore																											
Walnut																											
Willow																											
GENERAL																											
Bark																											
Diffuse Porous							10			15													20				
Shrub Wood																											
Unid. Hardwood				5				56	16		1			5	2			2	2		3			5	5		

TABLE III-10. NUMBER OF CANE AND WOOD FRAGMENTS RECOVERED FROM 3CT50 FEATURES.
(Page 5 of 5)

Feature	698	700	702	703	714	729	731	739	740	743	746	748	751	763	766	789	790	793	796	798	799	800	810	812	818	838	1003
Level															L-3												
IDENTIFIED																											
Ash			2			7				3									1								
Cane																											2
Cedar																											
Cherry																											
Chestnut																											
Conifer	1																				1	1				3	
Cottonwood																											
Elm	1					4			1		1		1														
Grapevine																											
Grass Stem																											
Hackberry																											
Hickory	5	1	2			20	2	2	5	1	6				2	1			1	3	1		3	3	1		
Holly																											
Honey Locust						1		2			1										2						
Maple																											
Mulberry						1																					
Oak	1				1	2		5	3					3		1		1	1				2	3	1		
Oak, Red		5	4			10					5																
Oak, White				2		2					5																
Osage Orange																							1				
Persimmon																											
Sweetgum																	4										
Sycamore								1																			
Walnut						5					1									3							
Willow						1					1										1						
GENERAL																											
Bark																											
Diffuse Porous																											
Shrub Wood																	1										
Unid. Hardwood	15		10			22					10	2				3										1	1

archaeological materials, especially other subsistence remains, macro-botanical materials are subject to the vagaries of natural and cultural processes. There are at least four problems which must be considered when evaluating archaeobotanical data:

1. Consideration must be given as to what plant materials might have been lost or destroyed during the recovery process.

2. Consideration must be given as to the post-depositional uses of the site area (i.e., agricultural practices, etc.).

3. Consideration of natural destructive processes such as erosion which have occurred since occuption and which might result in differential preservation and accidental inclusions of plant parts must be given.

4. And finally, consideration should be given to those plants which might have been part of the aboriginal subsistence regime but which have plant parts that are not normally preserved in open sites (i.e., tubers, rhizomes, bulbs, bark, sap, greens, flowers, stems, etc.).

If these points are kept in mind, then it is possible to evaluate macro-botanical materials and come to some general conclusions about at least one part of the subsistence pattern at 3CT50.

The macro-botanical data appear to support the following statements: 1) 3CT50 may have been occupied year-around; 2) there appears to have been an emphasis placed on nut-gathering and storage by the inhabitants; 3) semi-domesticates and domesticates were recovered from contexts which suggest their use at least by Late Baytown if not earlier; and 4) there does not appear to have been differential use of a particular genus or species through the occupational span of the site. Each of these points will be addressed in turn.

Seasons of Occupation(s)

One is always struck when perusing the archaeological literature by the number of sites which appear to have been inhabited only during the fall or winter months. Part of this stems from the differential preservation of macro-botanical remains mentioned above; the archaeological record will typically yield nut remains when it yields absolutely nothing else in the way of subsistence items.

Despite this interpretive problem, by looking at the 3CT50 macro-botanical remains *in toto* there is a suggestion that the site, at least during the Baytown occupation, may have been occupied year-around. This conclusion is based on the following lines of thought.

First, it is not axiomatic that nut remains mean a fall occupation. The nut fruits typically ripen from August through November,

depending on genus and species. Yet, the pattern of nut meat use documented ethnographically suggests that much of the harvest was stored, or rendered and then stored, for use during the waning months of the winter (February, March and early April) (Swanton 1946; Hudson 1976).

Second, if the seasons of availability for the various possible foodstuffs recovered from the site are listed out (Table III-11), it becomes apparent that that procurement of various nuts and fruits, and greens, was probably most intensive from about June through November and possibly December. Three food types which occur in some quantity in the 3CT50 sample are also available from January through March; these include honey locust, persimmon and one species of oak (*Quercus nuttallii*). Throughout the spring months (March through May), items such as pokeweed, smartweed and vetch could have augmented the early corn harvest, which typically coincides with the months of April and May.

As mentioned previously, the seasonal availability of foodstuffs does not obviate its use at other times of the year. As many of these items are known to have been stored for subsequent use (particularly items such as nuts and persimmon, the latter prepared in cake form), the archaeobotanical data suggests that use of the site on a year-around basis would not seem untoward.

The Emphasis on Nut-gathering and Storage

As with the faunal material recovered from the site, dominated by fish remains, so the macro-botanical sample was dominated by nut remains. Whether this reflects a bias because of differential preservation cannot be determined; it is apparent, however, that nut remains formed the bulk of floral materials recovered from the site.

The implications of this preponderance are not completely obvious. With the possible exception of walnut, the other nut types were probably easily obtainable within the immediate project vicinity. The fact that various nut species were found to commonly co-occur with one another suggests that the inhabitants were either storing the nuts and/or utilizing them in similar fashions. Ethnographically, most nut meats were used in two ways: they were either rendered in some manner for their oil or they were dried and ground for use as a meal or flour. Whether or not "hickory milk" would have served the same culinary function as pecan oil may be a moot point; what may be critical is that each of the nut types did require some sort of processing prior to its common uses by the natives.

There is no apparent correlation between the occurrence of the nut species and the types of features in which they are found, nor is there any indication that other plant types commonly were associated with the nut remains. In sum, the macro-botanical remains from the site are dominated by nut species, and by implication it would appear that selection for this food resource over others was being made by the inhabitants.

TABLE III-11. SEASONAL AVAILABILITY OF VARIOUS FOODSTUFFS.

PLANT (Common Name)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
WILD PLANTS												
Bean, wild						---	---	---	---	---	---	
Blackberry						---	---					
Composite							---	---	---	---	---	
Grape								---	---	---	---	---
Grass						---	---	---	---	---	---	---
Hawthorn								---	---	---		
Honey locust	---	---	---						---	---	---	---
Persimmon	---	---	---								---	---
Pokeweed				---	---		---	---	---	---	---	
Sumac						---	---	---	---	---	---	---
Vetch					---	---	---	---	---			
NUTS												
Hickory									---	---	---	---
Pecan									---	---		
Walnut									---	---		
Acorn	---	---							---	---	---	---
POTENTIAL DOMESTICATES												
Sunflower								---	---			
Sumpweed										---		
Maygrass						---	---					
Chenopod								---	---	---	---	---
Smartweed			---	---	---							
DOMESTICATES												
Maize				---	---			---	---	---		
Curcurbit						---	---	---	---	---	---	
Bean						---	---	---	---	---	---	

The Temporal Position of Potential Domesticates and Domesticates

From a anthropological perspective, one of the most critical pieces of data to be recovered from the 3CT50 excavations was that domesticates (including maize, curcurbits and beans) were present. The implications for the occurrence of domesticates in a collection are far-reaching, as it is documented that with the appearance of horticulture changes in social behaviors also occur within a society. Regrettably, the sum total of domesticates in the 3CT50 collection is relatively quite small, and on occurrence level alone would suggest that at no time in the occupations of the site were domesticates playing an economically dominant role.

It had been assumed from the initiation of fieldwork that the possibility of finding domesticates was strong. Klinger et al. (1984) during the Brougham Lake investigations had recovered maize and squash in what appeared to be Baytown contexts, and other investigators in the area had recovered such materials from Mississippian contexts.

Therefore, their occurrence and apparent temporal affiliations came as no surprise. What was unexpected was the fact that they were so few in number and that they seem to appear in approximately the same frequency for all three major occupations at the site (Baytown, late Baytown and Mississippian) (Table III-12).

Likewise, the potential domesticates, including sunflower, smartweed, sumpweed, maygrass and chenopod occur in all three contexts. Their incidence level, while greater than that of the domesticates, is also appreciably less than that of wild plants (including nuts). Again, as with the domesticates, the economic reliance upon these species does not appear to have been exceptional.

Differential Use of Particular Plants Through Time

There is no indication in any particular plant genus or species was being selectively exploited at any point in the history of the site's occupation.

TABLE III-12. THE ASSOCIATIONS OF DOMESTICATES.

Feature Type	Feature Number	Domesticate	Association
Postmold	31	Squash	not determined; no ceramics no structure association
	277	Squash	Structure 1 - Baytown
	303	Bean	not determined
	365	Squash	Structure 7 - Late Baytown/ Early Mississippian
	665	Squash	Structure 1 - Baytown
	680	Maize	only Baytown ceramics
	745A&B	Maize	Baytown(?) - features might be associated with Structure 1
	774	Bean	Structure 4 - Baytown
	811	Maize	only Baytown Plain ceramics
	812	Maize(?)	not determined
	833	Maize, squash	not determined
	837	Maize	only 1 Baytown Plain ceramic
Square/Rectangular Baked Clay Pits	51	Squash	only 3 Baytown Plain ceramics
Circular/Oval Baked Clay Pits	29A	Squash	not determined
	294	Maize	Baytown ceramics only
	295	Squash	Baytown ceramics only
	306	Maize, squash	Structure 7 - Late Baytown
	380	Maize	only Baytown ceramics
	419A	Squash	not determined
Shallow Basin Shaped Pits	29	Squash	not determined
	208	Squash	only 1 Baytown Plain ceramic
Straight-Walled, Deep Pits	903	Maize	Late Baytown/Mississippian
Trenches and Trough Shaped Pits	769	Maize	Late Baytown/Mississippian

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APPENDIX IV

BIOARCHAEOLOGY OF THE LITTLE CYPRESS BAYOU SITE

By

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INTRODUCTION

A total of four burials were recovered during the excavation of the Little Cypress Bayou site and analyzed by the Osteology Laboratory of the University of Arkansas. Bioarchaeology is the study of human skeletal remains within their archaeological context and, as a consequence, testable hypotheses are drawn from osteology, archaeology, and bioarchaeology. The hypotheses to be tested during the course of this project are derived from a problem domain hierarchy of increasing geographic scope (i.e., intrasite, micro-regional intersite, macro-regional intersite).

The following hypotheses were developed from the 3CT50 archaeological data and the prehistory of the Central Mississippi Valley (after Morse and Morse 1983). The questions were formulated in consideration of the material culture and subsistence remains most closely aligned with a Baytown affiliate, while radiocarbon dates on the burials fall within the range typically assumed to be Early Mississippian. Even artifacts associated with the burials appeared more Baytown than Mississippian. Consequently, the goals of this study were to examine these individuals from Little Cypress Bayou with comparative data from both Baytown and Mississippian components.

1. The diet of the 3CT50 inhabitants was similar to hunting and gathering Baytown groups and did not incorporate maize as a significant dietary staple.

2. The culture reflected at 3CT50 provided a high level of adaptive efficiency reflecting low stress levels, similar to Baytown groups.

3. The adoption of maize as a dietary staple antedated the "Mississippianization" of the Baytown peoples in the Central Mississippi Valley.

4. Using the Lower Illinois Valley as a model, the greatest period of stress and lowest level of adaptive efficiency should precede the adoption of maize agriculture and "Mississippianization" of the Central Mississippi Valley.

The testing of hypotheses with bioarchaeological data employs the comparative method and thus requires the collection and analysis of relevant large samples of skeletal data. Specifically, the bioarchaeologist must have access to regionally systematized diachronic skeletal data. These data do not exist for the Central and Lower Mississippi Valley because there has never been any systematic analysis of skeletal collections and as a consequence no bioarchaeological synthesis has ever been produced for these regions.

In order to provide the comparative data for testing the above listed hypotheses a three stage data search was conducted. The first stage was a literature search designed to locate all citations and published data for large skeletal series from the Central and Lower Mississippi Valley regions. Although this search was not comprehensive, it did produce a reasonably large body of osteological data. The second stage was an intensive search for archaeological summaries, theses, contract reports, local and regional journals, and the Arkansas site files for all citations and data from skeletal collections from northeast Arkansas. The third stage consisted of identifying all unstudied skeletal collections from northeast Arkansas housed in the University of Arkansas Museum and the University of Arkansas Osteology Laboratory. This search also produced a small amount of osteological data available only in manuscript form and previously unidentified. This literature and osteological collection search was organized into a reference table (Table IV-1) and the data collected was synthesized for interpretation and testing of the above listed hypotheses.

METHODOLOGY

All human skeletal material excavated from the Little Cypress Bayou site was delivered to the Osteology Laboratory of the University of Arkansas directly from the field without processing. Each burial was washed in a 50/50 solution of ethanol and water without immersion. All waste water and earth was waterscreened through hardware cloth and examined for small skeletal elements as well as floral and faunal remains; the latter two remains were forwarded to the appropriate investigators.

TABLE IV-1. BIOARCHAEOLOGICAL RESOURCES FROM THE CENTRAL MISSISSIPPI VALLEY AND ADJACENT REGIONS.

Site Name	Number	LMS Site No.[1]	No. of Individuals[2]	Culture	Analysis[3]	Osteology Citations[4]	Collection Location[5]	Archaeological Citations
Angola Farms		29-J-2	10	Historic	N		L.S.U.	Ford 1936
Banks	3CT13-17	11-P-8	27	Baytown	P	Ms. U.A.M.	U.A.M. U. Ill.	Perino 1960, 1966, 1967; Ms. U.A.M.
			539	Mississippian	N		U. Ill.?	
Barton Ranch	3CT18	11-O-10	8	Late Mississippian	N		U.A.M.	Ms. U.A.M. and A.A.S.
Bay Village (Norris Place)	3PO3/82		4	Middle Mississippian	P	Ms. U.A.O.	U.A.M. and U.A.O.	Arkansas Site Files
Big Eddy	3SF9	12-N-4	26	Late Mississippian	N		Smithsonian?	Moore 1910
Bonds			15	Baytown/Mississippian?	N		Miss. Dept. Archives and History	Connaway and McGahey 1970
Boydell	3AS58		15	Plaquemine	C	Rose et al. n.d.	U.A.O.	Jeter et al. 1979
Boytt's Field	3UN13		55	Mississippian	C	Hrdlicka 1909	Smithsonian	Moore 1909; Jeter et al. 1979
Bradley Place	3CT7	11-P-2	18	Late Mississippian	N		U.A.M.	Ms. U.A.M. and A.A.S.
Brougham Lake	3CT98		2	?	C	Rose 1981	U.A.M.	Klinger et al. 1984
Brownfield	3CY42	7-N-21	1	Baytown?	N		U.A.M.	Arkansas Site Files
Burris No. 2	3CG218		1	Middle Mississippian	C	Condon and Rose 1979	U.A.O.	Ms. A.A.S.
Campbell	23PM5	8-Q-7	32	Late Mississippian	P	Scott 1979; Spier 1955	U.M.C.	Chapman and Anderson 1955
Carson Lake	3MS13	10-P-1	3	Late Mississippian	N		U.A.O. and Hampson Museum	
Cherry Valley	3CS40	11-M-1	368	Middle Mississippian	N		U. Ill.	Perino 1959, 1967
Chickasaha Mound	3MS5/12	9-Q-2	1	Mississippian	N		U.A.O.	Palmer 1917
Chucalissa	40SY1	12-P-2	104	Late Mississippian	P	Nash 1972	Memphis State Univ.	Nash and Gates 1962
Clay Hill	3LE11	13-N-7	3	Middle Mississippian	N		U.A.O.	Arkansas Site Files
Crafton #1	3CY88		1	Baytown	P	Ms. U.A.O.	U.A.O.	Arkansas Site Files
Crooks		26-H-3	1172	Markaville	N		Univ. Chicago	Ford and Willey 1940
Cummings Place	3PO5		?	Late Mississippian	N		Smithsonian? Univ. Ala. Mus.?	Moore 1910; Ms. U.A.M.; Ms. U. Ala. Mus.
Danner Place	3CT35		1	Late Mississippian	N		U.A.M.	Arkansas Site Files and Ms. U.A.M.
DeRossitt	3SF49	12-N-10	3	Early Mississippian	N		U.A.M.	Spears 1978
Edwards	3CS120		2	Baytown	N		U.A.O.	Arkansas Site Files
Emerald Mound		26-L-1	19	Plaquemine	P	Steponaitis 1974	Peabody Museum, H.U.	Brain 1972; Brain et al. n.d.; Cotter 1951
Fatherland		26-K-2	59	Historic	N		Destroyed	Neitzel 1964, 1965, 1972
Floodway (Walnut)	3MS2	9-P-2	30+	Mississippian	P	Wakefield et al. 1937 Ms. Arkansas Site Files	Univ. Ala. Mus. Hampson Museum	Arkansas Site Files
Floodway Mounds	3PO46		13	Middle Mississippian	C	Ms. U.A.O.	U.A.O.	Arkansas Site Files
Frierson No. 2	3CG54		7	Archaic	N		U.A.O.	Arkansas Site Files
Gant Farm	3MS11	12-N-3	7	Late Mississippian	P	Ms. U.A.M.	U.A.M.	Arkansas Site Files
Gee's Landing	3OR17		34	Mississippian	N		?	Jeter et al. 1979; White 1970
Gold Mine	16RI13		150+	Baytown	P	Berg 1984; Walker 1980	U.A.O.	Belmont and Williams 1979; Kennedy and Jensen 1981; Jones 1979; Ms. U.A.O.
Golightly	3CT19	11-P-3	37	Middle Mississippian	P	Ms. U.A.M.; Wakefield and Dellinger 1937, 1940; Turner Ms. U.A.O.	U.A.M.	Ms. U.A.M. and A.A.S.
Gordon	22MJ1	26-L-2	16+	Plaquemine	P	Cotter 1952	Smithsonian?	Cotter 1952; Ford 1935, 1936

TABLE IV-1. BIOARCHAEOLOGICAL RESOURCES FROM THE CENTRAL MISSISSIPPI VALLEY AND ADJACENT REGIONS.
(Continuation)

Site Name	Number	LMS Site No.[1]	No. of Individuals[2]	Culture	Analysis[3]	Osteology Citations[4]	Collection Location[5]	Archaeological Citations
Gordon	3AS152		18	Historic	C	Rose et al. 1983	U.A.O.	Jeter et al. 1979
Grand Gulf Mound	Mississippi		?	Marksville	N		Destroyed	Brookes 1976
Great White Mound	22GR41		31	Marksville	N		Univ. Miss.	Connaway 1968
Greenhouse		28-H-2	107	Baytown & Coles Creek	N		L.S.U.	Belmont 1967b; Ford 1951
Hackberry			30	Historic	N		?	McGehee 1971
Haynes Bluff		22-M-5	5+	Historic	N		Peabody Museum, H.U.	
Hazel	3PO6	10-O-4	60+	Middle & Late Mississippian	P	Morse 1973a; Steele and McKern 1969; Sperber 1979; Wakefield and Dellinger 1940; Wakefield et al. 1937; Wolf 1976, 1977	U.A.M. and U.A.O.	Morse 1973a, 1973b, 1973c, 1973d; Morse and Smith 1973
Hearnes	23MI7		70	Middle Mississippian	N		U.M.C.	Klippel 1969
Helena Mounds	3PH11	14-N-6	107+	Marksville	P	Ford 1963	Am. Mus. Nat. Hist.	Ford 1961; 1963
Hoecake		5-S-2	?	Baytown	N		U.M.C.?	Marshall 1964a, 1964b, 1969
Humber-McWilliams	22CO601		54	Late Mississippian	N		Cottonlandia?	Tesar 1976; Tesar and Fichtner 1974
Hyneman (Payneway)	3PO192		2	Middle Mississippian	N		U.A.O.	Arkansas Site Files
Hyneman No. 1	3PO52		2	Middle Mississippian	P	Ms. U.A.O.	U.A.O.	Arkansas Site Files
			2	Baytown?				
Hyneman No. 2	3PO54		1	Baytown	C	Ms. U.A.O.	U.A.O.	Arkansas Site Files
John Wilson	3LW106		11	Middle Mississippian	C	Ms. U.A.O.	U.A.O.	Arkansas Site Files
Kelley-Grimes	3DE74		51	Late Mississippian	N		Destroyed	Jeter et al. 1979
Lake George		21-N-1	185	Coles Creek	P	Egnatz n.d.	Peabody Museum, H.U.	Jennings 1941; Williams and Brain n.d.
McArthur	3CH49		8	Plaquemine	C	Rose and Powell n.d.	Toltec Mds., S.P.	
Mangrum	3CG636		3	Middle Mississippian	C	Sperber 1982	U.A.O.	Klinger 1982; Klinger and Mathis 1978
Mangum	Mississippi		13	Plaquemine	C	Dailey 1974	Smithsonian and National Park Service	Bohannon 1963; Cotter 1952
Manny		22-M-6	4	Baytown	N		Peabody Museum, H.U.	Greengo 1964; Phillips 1970
Marksville	16AV1	28-H-1	24+	Marksville	N		Smithsonian	Ford 1936; Ford and Willey 1940; Fowke 1927, 1928; Setzler 1934; Toth 1974
Menard	3AR4	17-K-1	28	Historic	P	Ford 1961; Hrdlicka 1908	Smithsonian and Am. Mus. Nat. Hist.?	Ford 1961; Holder 1957; Phillips 1941; Moore 1908
Miller Mounds	3PO24	10-O-1	?	Late Mississippian	N		Smithsonian	Arkansas Site Files; Moore 1910
Morton Shell Mound	16IB3		275+	Coles Creek	C	Robbins 1976, 1978	L.S.U.	French 1950; Futch 1979; Neuman 1969
Mount Nebo	16MA18	23-K-12	77	Coles Creek	C	Giardino 1977	L.S.U.	Neuman 1970
Nodena	3MS3/4	10-Q-1	228	Late Mississippian	C	Powell 1983; Steele and McKern 1969; Wakefield and Dellinger 1940; Wakefield et al. 1937; Wolfe 1976, 1977	U.A.M. Hampson Museum U. Ala. Mus.	Morse 1973e
Old Town Ridge	3CG41		1	Late Mississippian	N		U.A.O.	Arkansas Site Files
Oliver		16-N-6	30	Late Mississippian - Historic	N		Peabody Museum, H.U.	Belmont 1961; Peabody 1904
Parkin	3CS29	11-N-1	16	Late Mississippian	P	Ms. U.A.M.	U.A.M.	Klinger 1977; P. Morse 1981
Pecan Point	3MS78	11-P-6	13	Mississippian	P	Mehta and Sensening 1966	Smithsonian	

TABLE IV-1. BIOARCHAEOLOGICAL RESOURCES FROM THE CENTRAL MISSISSIPPI VALLEY AND ADJACENT REGIONS.
(Continuation)

Site Name	Number	LMS Site No.[1]	No. of Individuals[2]	Culture	Analysis[3]	Osteology Citations[4]	Collection Location[5]	Archaeological Citations
Pierce Cache	3CG78		1	?	N		U.A.O.	Arkansas Site Files
Pinson Mounds	40MD1		5+	Marksville	N		Univ. Tenn.-Memphis Univ. Tenn.-Knoxville	Broster and Adair 1975; Broster and Schneider 1976, 1977; Fischer and McNutt 1962
Powell Canal	3CH14		6	Baytown	C	Blaeuer and Rose 1982	U.A.O.	House 1982
Richardson	3MS22		1	Late Mississippian	N		U.A.O.	Arkansas Site Files
Rose Mounds	3CS27	12-N-3	2+	Middle Mississippian	N		U.A.M. and Peabody Museum, H.U.	Ms. U.A.M. and A.A.S.
St. Gabriel	16IV128		24	Coles Creek	C	Woodiel 1980b	L.S.U.	Woodiel 1980a, 1980b
Taylor's Shanty	3P04	10-O-6	?	Late Mississippian	N		Smithsonian?	Thomas 1894
Thorton		22-M-1	10+	Baytown	N		Peabody Museum, H.U.	Greengo 1964; Phillips 1970
Togo/Neeley's Ferry	3CS24/28	11-N-4	71	Late Mississippian	P	Turner Ms. U.A.O.	U.A.M. and Peabody Museum, H.U.	Moore 1910; Ms. U.A.M. and A.A.S.
Troyville		26-I-1	12	Troyville	N		Destroyed	Walker 1936
Trudeau			?	Historic	N		Peabody Museum, H.U.	Brain 1973
Tschundy Lumber Co.	3PO1		5	Middle Mississippian	N		U.A.M.	Arkansas Site Files
Turner	23BU21b		64	Late Mississippian	C	Black 1979	Univ. Michigan	Price and Griffin 1979
Vernon Paul	3CS25	11-N-9	96	Late Mississippian	P	Sperber 1979; Steele and McKern 1969; Wakefield and Dellinger 1940; Wakefield et al. 1937; Turner Ms. U.A.O.	U.A.M.	Ms. U.A.M. and A.A.S.
Wapanocca	3CT9		16	Late Mississippian	P	Turner Ms. U.A.O.	U.A.M.	Ms. U.A.M.
Warner Smith Place	3CT44		4	Late Mississippian	N		U.A.M.	Ms. U.A.M.
Weist	3CG37		3?	Archaic?, Mississippian?	N		U.A.O.	Arkansas Site Files
Wildy Place	3MS10	10-P-8	1	Late Mississippian	N		U.A.O.	Arkansas Site Files
Winterville		19-L-1	16+	Middle Mississippian	P	Brain 1969	Yale University	Brain 1969; Jennings 1940; Marshall 1967
Womack Mound	22YA1		25	Marksville	C	Heckel 1966	Mississippi?	Koehler 1966
Zebree	3MS20		27 5	Early Mississippian Middle Mississippian	C	Powell 1976	U.A.O.	Morse and Morse 1978
Unnamed	3CS92		1	Baytown	N		U.A.O.	Arkansas Site Files

1 L.M.S. Site No. is the number assigned by the Lower Mississippi Survey, Peabody Museum, Harvard University (Phillips 1970).
2 No. of Individuals is the number of individual skeletons retained at various locations and not necessarily the number excavated.
3 Analysis is skeletal analysis: N = no analysis; P = partial analysis; C = complete analysis
4 Ms. indicates manuscript data and location
5 Locations of collections:
LSU = Louisiana State University
U.A.M. = University of Arkansas, Fayetteville Museum
U.A.O. = University of Arkansas, Osteology Laboratory, Anthropology
U. Ill. = University of Illinois, Urbana - Champaign
U.M.C. = University of Missouri, Columbia
Univ. Ala. Mus. = Alabama Museum of National History
Univ. Miss. = University of Mississippi
Peabody Mus., H.U. = Peabody Museum, Harvard University
Toltec Mounds, S.P. = Toltec Mounds, Arkansas State Park

All broken skeletal elements were reconstructed prior to labeling with accession numbers. The skeletons were then arranged in anatomical position for analysis, and each was inventoried and measured (after Bass 1971).

Sex was determined using a modification of the procedures developed by Acsadi and Nemeskeri (1970). Each morphological and metric feature useful in sex determination was scored on a scale of +2 (hypermasculine) to -2 (hyperfeminine) and a weighted mean score was calculated to assign sex. All criteria used for scoring were derived from the published literature (Ubelaker 1978; Bass 1971; Acsadi and Nemeskeri 1970; Krogman 1962) and standardized by seriation of Arkansas Osteology Laboratory. Reliability of each sex determination was assessed by grouping all recorded observations from each burial into four categories: size and robusticity; muscle attachments; non-pelvic shape; and pelvic morphology. Sex determination was considered reliable if two or more observations could be made from the pelvis and one other category. No sex determination was attempted on individuals younger than 16 years of age.

Age determination of children employed dental developmental standards (Ubelaker 1978; Schour and Massler 1945), while juveniles were aged by epiphysial closure (Brothwell 1972; Krogman 1962). Adults were aged by degenerative changes in the pubic symphysis using models for both males (McKern and Stewart 1957) and females (Gilbert and McKern 1973). Because this technique is most reliable for the younger age categories, the Todd technique was also employed (Todd 1920). Additionally, because the pubis is rarely preserved, a technique based on degenerative changes of the sacral surfaces was also employed (Lovejoy, personal communication). The technique consists of a description and photograph for each five year adult age category. An age assignment was made only after all the above indicators were reconciled.

All bones were examined macroscopically and with the aid of a stereomicroscope for identification of pathological lesions. Each lesion was diagnosed using comparative collections and the published paleopathology literature (e.g., Ortner and Putschar 1981; Steinbock 1976). Periosteal reactions and porotic hyperostosis were classified as either active or healing using the criteria established by Mensforth et al. (1978). All pathological lesions were grouped into etiological categories (e.g., infections, metabolic disturbances, etc.) for comparison with the published data from other skeletal collections. All data obtained from the published and manuscript bioarchaeological literature was carefully reviewed and modified if necessary to conform to the data obtained from 3CT50.

The dentitions were inventoried and scored for caries, dental attrition, abscessing, calculus deposits, agenesis, antemortem exfoliation, and dental morphology. Caries were identified by dental examination under good illumination with a sharp dental explorer and tabulated by tooth surface following the procedures of Moore and Corbett (1971). Quantification of dental attrition employed the Scott

(1979) system which scores each molar occlusal surface quadrant from one to ten on the basis of the proportional area of enamel wear facets and remaining enamel when the dentin is exposed. Mean scores for each molar type (i.e., first, second, and third) were computed for comparison with other skeletal series. Abscesses were scored by the presence of observable drainage passages in the mandible and maxilla. Antemortem tooth loss was differentiated from postmortem loss by the presence of remodeling activity within the tooth sockets.

As a complement to the attrition analysis, the molar surfaces were observed with the scanning electron microscope (Moore-Jansen 1982; Ryan 1979). Nine permanent second mandibular molars were selected for examination from the Little Cypress Bayou, Zebree, and John Wilson sites. The crowns were removed from their roots, cleaned in a sonic cleaner with ethanol, mounted on aluminum posts, and coated with 17.3 nonometers of gold (P.I.I. sputtering system). The mesiolingual cusps were marked and the specimens were examined with an I.S.I. 60 scanning electron microscope set at a beam angle of 15° and a voltage of 30KV. Each mesiolingual cusp was photographed (Polaroid type 55+/- film) at low magnification (i.e., 15-20X). The surface of each cusp was examined at 500 magnifications and three micrographs were taken at 1500 magnifications to characterize the surface topography of the cusp. These procedures were standardized for comparability to other data previously collected.

Stable Carbon Isotope Analysis

Five bone samples were prepared for stable carbon isotope analysis by Dr. Larry Tieszen of the Department of Biology, Augustana College, Sioux Falls, South Dakota. Three of the samples were from Burials 1, 2 and 3 at 3CT50. Two samples from the Banks site (Burials 60-110-06 and 60-110-01) were also subjected to analysis. The latter had been preserved in some unknown manner. Chemical extractions with acetone and ethanol were unsuccessful in removing the preservative. Methylene chloride extraction, however, removed the contaminating material.

The samples were cleaned by removing soil material and by sonication in distilled water for 15 minutes. Samples were oven dried at 50°C and then ground in a Wiley mill to pass through a 20-mesh screen. Exchangeable carbonates were removed from the pulverized samples by placing two gram samples in 200 ml of 1 M HCL at room temperature for 24 hours with stirring. The samples were placed in 1 M NaOH at room temperature for 24 hours with agitators to remove soil humic substances.

The bone samples, then, were washed to neutrality with distilled water. Collagen was solubilized from the bone by incubation in distilled water at PH=3 at 90°C for 24 hours and stirred occasionally (DeNiro and Epstein 1981; Hakansson 1976; Longin 1971). The mixture was centrifuged at 300 x 9 for 15 minutes to precipitate the bone fragments. The supernatant was removed and dried at 60°C to obtain collagen. Collagen was converted to CO_2 grams by combustion in the

presence of an oxidizing agent (Boutton et al. 1982; Buchanan and Corcoran 1959). Quartz tubes (9mm) were cut to 30 cm lengths, sealed at one end, and loaded with two grams of active oxidant and a $9mm^2$ piece of silver foil. The combustion tubes were heated in a muffle furnace at 850°C for one hour to bake out potential organic contaminants. After cooling, six grams of collagen was mixed with the oxidant. Tubes were attached to vacuum manifold, evacuated to 10-3 torr, and sealed with a torch. Sealed tubes were combusted in a muffle furnace at 850°C for one hour and then cooled to room temperature.

Combusted sample tubes were attached to a purified vacuum line connected to the inlet system of the mass spectrometer. Sample tubes were opened under vacuum using a tube-cracker (Des Marais and Hayes 1976), and the gases were passed through a dry ice trap to remove water vapor and a liquid nitrogen trap to collect CO_2. Noncondensible gases were pumped away. The purified CO_2 was thawed and admitted into the inlet system of the mass spectrometer for determination of isotopic composition.

Isotope ratios were measured on a Micromass 602E, a dual inlet, double collector mass spectrometer. The mass 45 to mass 44 ratio of CO_2 from the sample material was compared with that of a standard gas of known isotopic composition. Results are expressed as:

$$\text{d13C\%.} = \frac{\text{R sample} - \text{R standard}}{\text{R standard}} \times 1000$$

where R is the mass 45 to mass 44 ratio. Values were corrected for errors from switching valve leakage and 17O contribution to mass 45 abundance. All results are reported relative to the international PDB standard. The two replicates represent independent extracts and therefore, incorporate laboratory as well as instrumental error.

RESULTS

The interpretation of the Big Creek site skeletal data is preceded by a detailed description of each burial. This format is chosen to facilitate the use of these data by future investigators.

Burial Descriptions

Burial 1 (Feature 650)

This 30 to 35 year old male was interred as a primary flexed burial lying on his right side. Bone preservation is very good and the individual is represented by a nearly complete, although partially fragmented skeleton (see Table IV-2 for a complete inventory). The right knee (i.e., distal 1/3 of the femur, patella, and proximal tibia) are missing due to farming or earth moving activity.

TABLE IV-2. SKELETAL INVENTORY FOR THE LITTLE CYPRESS BAYOU SITE (3CT50).

Burial	Frontal		Parietol		Occipitol		Temporal		Maxilla		Mandible		Maxillary	Mandibular	Clavicle		Scapula		Sternum
Number	R	L	R	L	R	L	R	L	R	L	R	L	Teeth	Teeth	R	L	R	L	
1	C	C	C	C	C	P	C	C	P	P	C	C	C	C	C	C	P	P	A
2	C	C	P	P	F	F	P	F	P	C	C	C	C	C	C	C	P	P	C
2a	P	P	P	P	P	P	P	P	A	A	C	C	A	A	C	A	P	P	A
3	C	C	C	C	C	C	P	P	C	P	C	C	C	C	C	C	P	P	P
4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Burial	Vertabrae			Ribs		Humerus		Radius		Ulna		Hands		Pelvis		Sacrum	Femur		Patella		Tibia		Fibula		Feet	
Number	Cervical	Thorocic	Lumbar	R	L	R	L	R	L	R	L	R	L	R	L		R	L	R	L	R	L	R	L	R	L
1	P	P	P	C	C	C	C	C	C	C	C	C	C	C	C	F	P	C	A	C	P	C	P	C	P	P
2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A	A	A	A	A	A
2a	P	P	P	P	P	C	C	P	P	C	P	-	-	F	P	A	A	P	-	-	C	C	C	P	-	-
3	C	C	C	P	P	C	C	C	C	C	C	P	P	C	C	P	C	C	C	C	C	P	C	P	C	C
4	A	A	F	F	F	P	-	F	-	F	-	-	-	F	-	A	F	-	-	-	-	-	-	-	F	F

Key

C = Complete Bone 90-100%
P = Partial Bone 50-90%
F = Fragmentary Bone 50% or Less
A = Absent

The only observable pathology is mild osteophytosis of the inferior margin of the fifth lumbar vertebra (Figure IV-1) and a Schmorl's node on the superior surface of the centrum of the fourth lumbar vertebra. The presence of these lesions in such a young individual argues for activity patterns which produced severe back stress.

The cranium exhibits a generalized pattern of porotic pitting involving the area of the sagital suture and extending laterally down each parietal. This lesion is fairly common throughout the Mississippi Valley, but does not match the porotic hyperostosis lesion type (Blaeuer and Rose 1982). Consequently, iron deficiency anemia is not indicated for this individual.

The dentition exhibits moderately heavy wear for an individual of this age (Table IV-3). The most interesting feature of this individual's dentition is the frequent marginal chipping of both the anterior and posterior dentition (see Figure IV-2). This degree of marginal chipping indicates abnormal use of the teeth as a tool or food processing implement (e.g., nutcracker). Four pinhole sized occlusal caries (Table IV-4) were observed. These caries appear to be due to the exposure of dentin by the enamel chipping. All available measurements are listed in Table IV-5.

TABLE IV-3. SCOTT MOLAR ATTRITION SCORES FOR THE LITTLE CYPRESS BAYOU (3CT50) SKELETAL SERIES.

Burial Number	Molar Number	Maxillary Scott Score	Mandibular Scott Score
1	M3	17	15
	M2	16	16
	M1	17	28
	M1	19	22
	M2	36	16
	M3	16	13
2	M3	4	4
	M2	7	32
	M1	20	21
	M1	20	21
	M2	6	32
	M3	4	4
3	M3	-	-
	M2	0	0
	M1	4	4
	M1	4	4
	M2	0	0
	M3	-	-

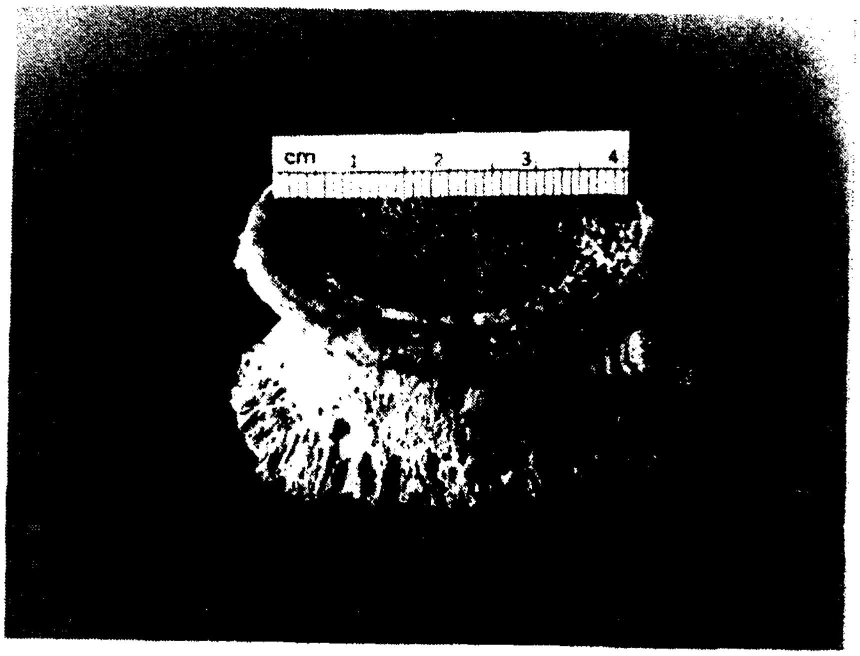

FIGURE IV-1. OSTEOPHYTOSIS OF FIFTH LUMBAR VERTEBRA, BURIAL 1 (FEATURE 650).

FIGURE IV-2. LABIAL-BUCCAL VIEW OF LEFT MAXILLARY DENTITION EXHIBITING MARGINAL FRACTURES, BURIAL 1 (FEATURE 650).

TABLE IV-4. CARIES PER TOOTH BY TOOTH SURFACE FOR THE LITTLE CYPRESS BAYOU (3CT50) SKELETAL SERIES.

	Occlusal	Inter Proximal	Cervicol	Smooth Surface	Root	Total Caries	Total Teeth
Burial 1							
Molars	4	0	0	0	0	4	12
Canines	0	0	0	0	0	0	4
Incisors	0	0	0	0	0	0	8
Burial 2							
Molars	0	0	0	0	0	0	12
Canines	0	0	0	0	0	0	4
Incisors	0	0	0	0	0	0	7
Burial 3							
Molars	4	0	0	0	0	4	8
Canines	0	0	0	0	0	0	4
Incisors	0	0	0	0	0	0	8
Total	8	0	0	0	0	8	67

TABLE IV-5. MANDIBULAR AND POSTCRANIAL MEASUREMENTS OF THE LITTLE CYPRESS BAYOU (3CT50) SKELETAL MATERIAL [in centimeters].

	Burial 1	Burial 2
Mandible		
Mandibular length	----	7.10
Ascending ramus height	----	4.85
Symphyseal height	----	3.12
Humerus		
Maximum length	----	29.27
Minimum head diameter	4.00	3.80
Midshaft circumference	----	6.00
Radius		
Maximum length	25.4	23.4
Ulna		
Maximum length	27.8	----
Femur		
Maximum head diameter	4.35	4.50
Midshaft circumference	8.50	7.60
Subtrochonteric A-P diameter	3.20	2.50
Subtrochonteric M-L diameter	2.40	2.30

Burial 2 (Feature 905)

This 22 to 24 year old female was interred as a primary extended burial lying supine in a shallow elongated pit. The burial pit (Feature 905) overlies and intrudes into the top of Feature 906 (a fired clay pit), while her lower legs and feet extended into the road and remained unexcavated. Bone preservation is very good and the individual is represented by a partially complete (80 percent) although fragmented skeleton (see Table IV-2). A fetus (seven months) was recovered from the earth matrix encasing the pelvic and sacral elements (Burial 2a).

The only observable pathology is spina bifida, a congenital failure of the neural arch of the sacrum to fuse (Figure IV-3). It is possible that this congenital defect combined with the physical demands of a near term pregnancy could have been a contributing cause of death for this young woman.

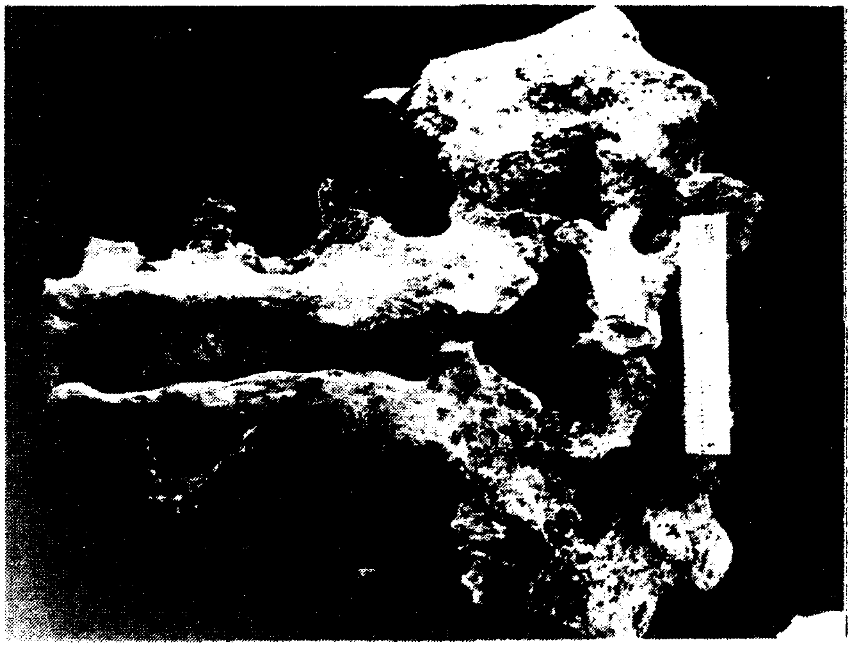

FIGURE IV-3. SPINA BIFIDA PATHOLOGY OF BURIAL 2 (FEATURE 905).

The dentition again exhibits marginal enamel chipping, which in this case is associated with a severe hypoplastic defect of the enamel (Figure IV-4). This hypoplastic episode, occurring at approximately 4.5 years of age, indicates a severe stress experience. This was just the most severe of a series of stress events extending between two and six years of age. No caries were observed on this individual.

Burial 2a (Feature 905): The fetus removed from the pelvis of Burial 2 was aged at seven months *in utero*. This skeleton is nearly complete but extremely fragmented due to the delicate nature of the boney elements (Figure IV-5). No pathological lesions were observed indicating a normal pregnancy until the time of the mother's death.

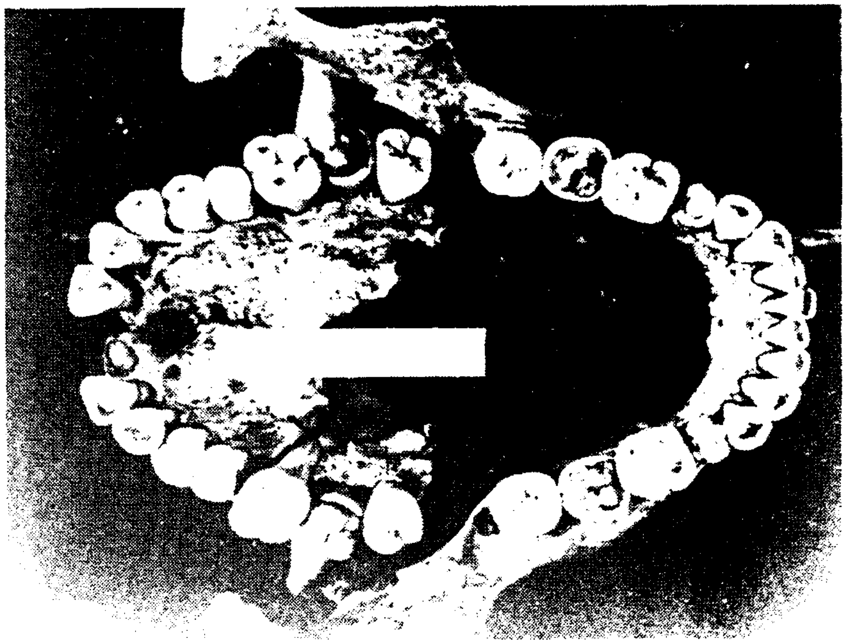

FIGURE IV-4. OCCLUSAL VIEW OF BURIAL 2 (FEATURE 905) DENTITION; PATHOLOGY ON M_2 (SECOND MOLAR).

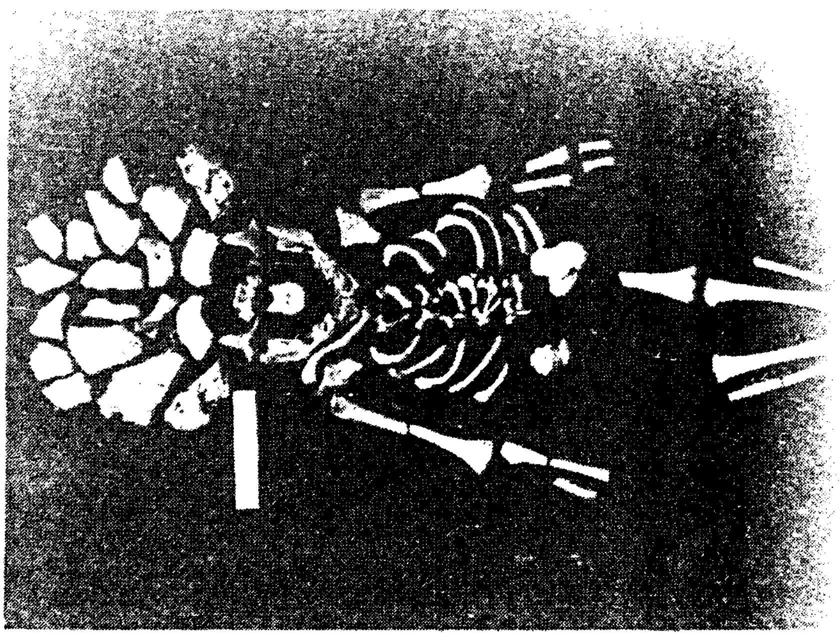

FIGURE IV-5. FETAL SKELETON (BURIAL 2A) FROM SACRAL-PELVIC AREA OF BURIAL 2 (FEATURE 905).

Burial 3 (Feature 654)

This 12 year old individual was interred as a primary extended burial in a supine position in an elongated oval pit with a rounded bottom. The presence of ash in the pit and a small charnel structure marks this juvenile as an unusual burial. Bone preservation is excellent and the individual is represented by a nearly complete, although partially fragmented cranial and postcranial skeleton (see Table IV-2). Molar attrition is moderately severe for such a young individual (see Table IV-3) and four occlusal caries are present. No pathologies are present on any of these remains.

Burial 4 (Feature 788)

This very fragmentary adult appears to have been hit and moved across the site by farming or earth moving equipment. The skeleton excavated from the baulk wall and surface scatter is represented by the following skeletal elements: distal half of the right humerus, proximal right ulna, right radial shaft, 14 rib fragments, two unidentifiable cranial fragments, two sections of the right posterior iliac crest, one inferior vertebral articular process, one fragment of the femur midshaft, and six metatarsal or metacarpal shaft fragments. No pathologies are observable.

CONCLUSIONS

The four hypotheses derived from an examination of the literature pertinent to the archaeology of the Central Mississippi Valley were selected for testing with the bioarchaeological data derived from 3CT50. The testing of the hypotheses, presented in the Introduction to this appendix, could not be adequately completed by this particular project, but they were refined. Additionally, the conclusions reached will serve as baselines from which research can be directed toward the future collection of the necessary data sets.

Hypothesis 1

The diet of the Big Creek site inhabitants was similar to hunting and gathering Baytown groups and did not incorporate maize as a significant dietary staple.

Discussion

Researchers have used large samples of prehistoric and historic skeletal samples to demonstrate that the proportion of the diet derived from processed carbohydrates can be reliably estimated by dental caries rates (Turner 1979; Moore and Corbette 1971; Hardwick 1960). An examination of Table IV-6 indicates that the Baytown sites reviewed consistently display caries rates well below the 2.0 caries per person cut off mark for a high carbohydrate diet previously established (Rose 1982). These data suggest that low carbohydrate diets (and presumably no maize consumption) were typical of Baytown subsistence patterns.

TABLE IV-6. DENTAL CARIES PER PERSON IN THE MISSISSIPPI VALLEY.

Culture and Site		Reference	Caries/Person	N
LATE MISSISSIPPIAN				
Gordon	3AS152	Rose n.d.	5.6	14
Upper Nodena	3MS4	Powell 1983	3.9	103
Middle Nodena	3MS3	Powell 1983	2.7	52
Hazel	3P06	Powell 1983	2.6	33
Turner	23BU21b	Black 1979	1.4+	52
Campbell	23PM5	Spier 1955	1.8+	27
MIDDLE MISSISSIPPIAN				
Floodway	3P046	Rose n.d.	3.0	1
Burris	3CG218	Condon & Rose 1979	1.0	1
Bay Village	3P03	Rose n.d.	9.0	1
Mangrum	3CG636	Sperber 1982	2.0	1
Zebree	3MS20	Powell 1976	0.0	2
John Wilson	3LW106	Rose n.d.	2.6	7
EARLY MISSISSIPPIAN				
Zebree	3MS20	Powell 1976	2.4	13
Little Cypress Bayou*	3CT50	Rose et al. 1985	2.7	3
COLES CREEK				
Lake George	21-N-1	Egnatz n.d.	1.6+	11
Mount Nebo	16MA18	Giardino 1977	8.1	86
Alexander	3CN117	Rose & Marks 1983	3.0	1
BAYTOWN				
Little Cypress Bayou*	3CT50	Rose et al. 1985	2.7	3
Hyneman 2	3P054	Rose n.d.	0.0	1
Banks	3CT13-17	Rose et al. 1985	0.9	7
Powel Canal	3CH14	Blaeuer & Rose 1982	0.5	4
Gold Mine	16RI13	Walker 1980	1.1	89
MARKSVILLE				
Womack Mound	22YA1	Heckel 1960	0.0	7

+ Indicates data reporting which would greatly underestimate total caries rates

* Since Little Cypress Bayou produced cultural remains and absolute dates that fit temporally within both Baytown and Early Mississippian, the site is listed under both periods for ease of comparison in these conclusions.

The caries rate of 2.7 caries per person from the Little Cypress Bayou site suggests a carbohydrate consumption higher than the other Baytown sites and comparable to the Big Lake phase occupation at

Zebree, with which 3CT50 is approximately contemporaneous. The one qualification which must be made is that the adult caries are pin hole sized and located in chipped occlusal enamel (Burial 1). If the Big Creek diet was indeed high in carbohydrates, it is surprising that not a single large carie was found. In addition, the hypoplastic lesions on the teeth of Burial 2 should have been carious if the diet had been high in carbohydrates (Cook and Buikstra 1979). Because of the young age at death, the caries in Burial 3 could be due to a high carbohydrate diet. The small sample size makes a definitive statement impossible, but these data suggest a low to moderate processed carbohydrate consumption at 3CT50.

The amount of dental attrition (i.e., gradual removal of enamel from the molar surfaces) is an excellent indicator of the abrasive quality of prehistoric diets. Also it is useful for isolating particular food preparation techniques and characterizing the overall subsistence strategies of prehistoric groups (Molnar 1972). Comparing the raw mean scores (Table IV-7) indicates that molar attrition is consistently greater during the Baytown period than during the Mississippian, and thus Baytown diets were consistently coarser and contained more abrasive particles. The Baytown scores reported here are typical of Southeastern hunting and gathering cultures (Rose 1982). Comparing the differences between the means, which is a simple adjustment for sample age differences, indicates that the Little Cypress Bayou site is most similar to the Baytown sample from the Banks site, and somewhat different from the Lower Valley Baytown samples. Thus, there appears to be a greater similarity of diets within each portion of the Valley and greater differences between the two portions.

Observation of the occlusal surfaces of molars with the scanning electron microscope (S.E.M.) has made significant contributions to the reconstruction of prehistoric diets (Moore-Jansen 1982; Rose et al. 1981; Ryan 1979). Methodologies for quantitative analysis are still in the developmental stages and despite criticism of qualitative interpretations (Gordon and Walker 1983), Moore-Jansen (1982) has demonstrated that subjective comparisons of molar surface microwear patterns between prehistoric skeletal series can differentiate dietary patterns.

Reliable interpretations of diet using this technique is dependent upon the availability of a regionally restricted temporal sequence of scanning electron microscope observations of molar surfaces. Only a partial series of microwear data were previously available for the Mississippi Valley. The earliest available microwear observations are from two Baytown sites in the Lower Mississippi Valley: the Gold Mine site (16RI13) in northeast Louisiana; and the Powell Canal site (3CH14) in southeastern Arkansas (Blaeuer and Rose 1982). No Coles Creek data are available from the Mississippi Valley, but the Alexander site (3CN117), located on the Arkansas River west of Little Rock, has been studied (Rose and Marks 1983). The final available data set is from the Gordon site (3AS152), a Mississippian/Protohistoric occupation in southeast Arkansas (Moore-Jansen 1982).

TABLE IV-7. MEAN SCOTT MOLAR WEAR SCORES.

Culture and Site		Maxillary M_1	Maxillary M_2	Maxillary Difference	Mandibular M_1	Mandibular M_2	Mandibular Difference
MISSISSIPPIAN							
Campbell (Scott 1979)	23PM5	19.3 (64)	15.1 (64)	4.2	17.6 (68)	14.6 (68)	3.0
Upper Nodena (Powell 1983)	3MS4	17.3 (125)	13.5 (123)	3.8	16.5 (102)	13.9 (101)	2.6
Middle Nodena (Powell 1983)	3MS3	17.9 (54)	13.6 (42)	4.3	16.4 (57)	13.9 (55)	2.5
Little Cypress Bayou	3CT50	18.5 (2)	11.5 (2)	7.0	21.5 (2)	24.0 (2)	2.5
BAYTOWN							
Banks	3CT13-17	34.7 (3)	27.4 (5)	7.3	28.8 (5)	26.0 (5)	2.8
Little Cypress Bayou	3CT50	18.5 (2)	11.5 (2)	7.0	21.5 (2)	24.0 (2)	2.5
Gold Mine (Walker 1980)	16RI13	23.0 (89)	23.4 (89)	-0.4	24.0 (89)	22.3 (89)	1.7
Powell Canal (Blaeuer & Rose 1982)	3CH14	20.5 (4)	22.8 (4)	-2.3	23.4 (4)	25.0 (4)	-1.6

Since Little Cypress Bayou produced cultural remains and absolute dates that fit temporally within both Baytown and Early Mississippian, the site is listed under both periods for ease of comparison.

Because there is a large temporal-regional gap in these data, an attempt was made to study previously unanalyzed skeletal collections. Unfortunately, three critical sites from northeast Arkansas could not be used. Preservation at both DeRossitt (3SF49) and Brougham Lake (3CT98) was so poor that mandibular molars were not available, and the Banks site (3CT13-17) could not be used because the teeth had been cleaned with brushes and coated with preservative. However, both the Little Cypress Bayou and Mississippian material from Zebree (3MS20) were studied, in addition to the Middle Mississippian material from the John Wilson site (3LW106).

The Burial 1 second mandibular molar surface is characterized by a rough surface, frequent compression fractures, and numerous large striations (Figure IV-6). The surface at high magnification (1500X) is characterized by large striations with rounded contours, frequent intermediate sized striations, and an extensively polished surface (Figure IV-7). This pattern indicates the consumption of hickory nuts, large amounts of minimally processed plant fibers, and a coarse diet prepared with stone implements. The overall pattern shows the greatest similarity to the Baytown sites of Gold Mine and Powell Canal (Blaeuer and Rose 1982), although considerably more plant fiber was consumed by this 3CT50 individual.

The Burial 2 first mandibular molar surface is characterized as rough with a moderate number of compression fractures, and numerous large striations (Figure IV-8). At higher magnification the molar surface reveals large striations with sharp borders, numerous sharp intermediate sized striations, microstriations, and no evidence of polishing (Figure IV-9). The pattern again indicates the consumption of small amounts of hickory nuts and a coarse diet prepared with stone utensils. This individual differs from Burial 1 in the total absence of polishing, which suggests either extensive processing or no consumption of plant fibers. Although there are many similarities between this individual and those from Gold Mine and Powell Canal, the absence of polishing makes the pattern most similar to that of the Big Lake individual from the Zebree site.

The Burial 3 mandibular first molar differs completely from the other two 3CT50 individuals. The molar surface is characterized as flat and smooth with a few compression fractures and a small number of large striations (Figure IV-10). At high magnification most of the intermediate sized striations are rounded and obliterated by polishing and the smooth surface is attributable to the virtual absence of large striations (Figure IV-11). Because the compression fractures significantly differ in pattern and form from the typical compression fractures, the suggestion of hickory nut consumption cannot be made in this case. Taken as a whole this pattern is atypical and does not match any of the 30+ cultural samples studied at the University of Arkansas. Only a moderate similarity with the Mississippian John Wilson teeth can be seen and as a consequence no dietary interpretation is offered.

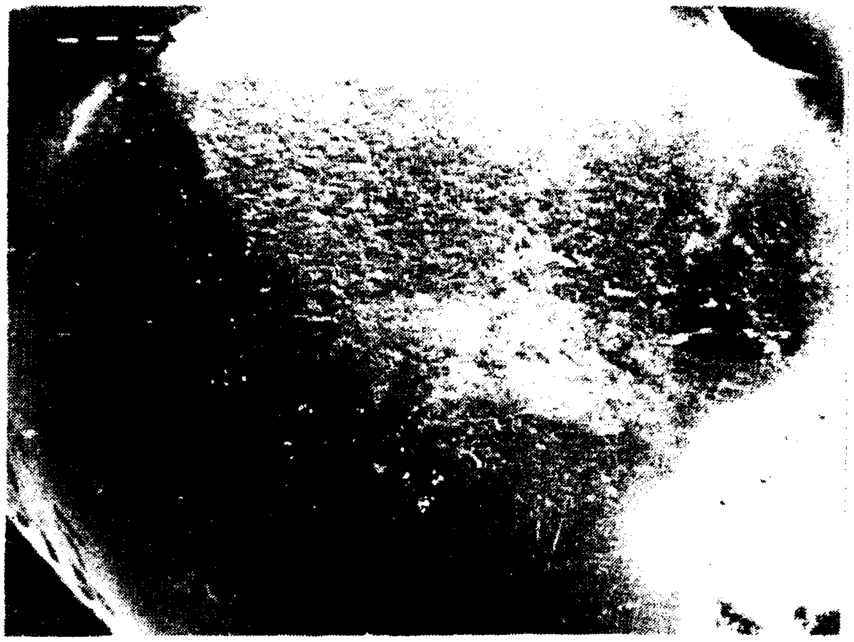

FIGURE IV-6. COMPRESSION FRACTURES, STRIATIONS AND ROUGHENED SURFACE OF SECOND MANDIBULAR MOLAR, BURIAL 1 (18x magnification).

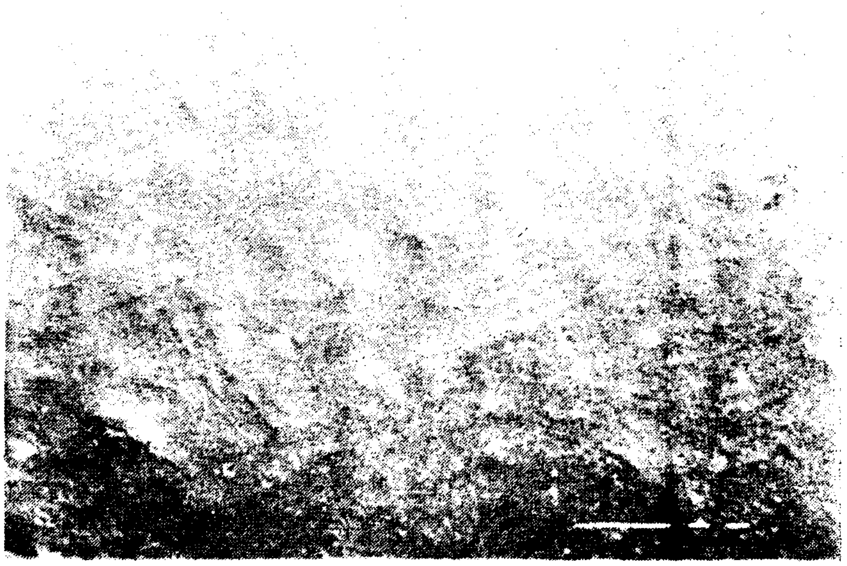

FIGURE IV-7. POLISHING AND WEAR STRIATIONS ON SECOND MANDIBULAR MOLAR, BURIAL 1 (1500x magnification).

FIGURE IV-8. COMPRESSION FRACTURES, STRIATIONS AND ROUGHENED SURFACE OF THE FIRST MANDIBULAR MOLAR, BURIAL 2 (17x magnification).

FIGURE IV-9. LARGE STRIATIONS WITH SHARP BOUNDARIES, SHARP INTERMEDIATE SIZE STRIATIONS, MICROSTRIATIONS AND NO EVIDENCE OF POLISHING; FIRST MANDIBULAR MOLAR, BURIAL 2 (1500x magnification).

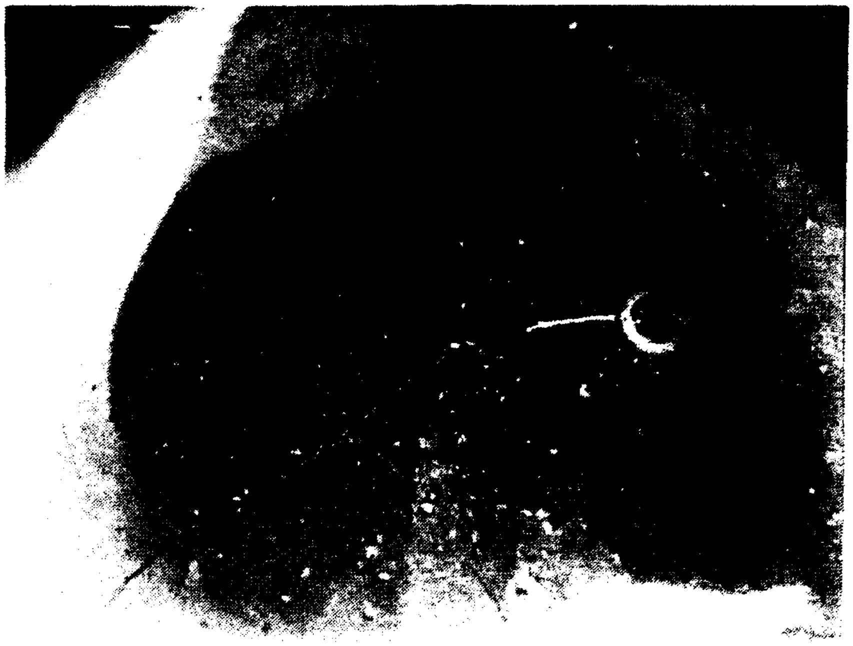

FIGURE IV-10. FLAT AND SMOOTH SURFACE EXHIBITING FEW COMPRESSION FRACTURES AND A SMALL NUMBER OF STRIATIONS ON THE FIRST MANDIBULAR MOLAR OF BURIAL 3 (18x magnification).

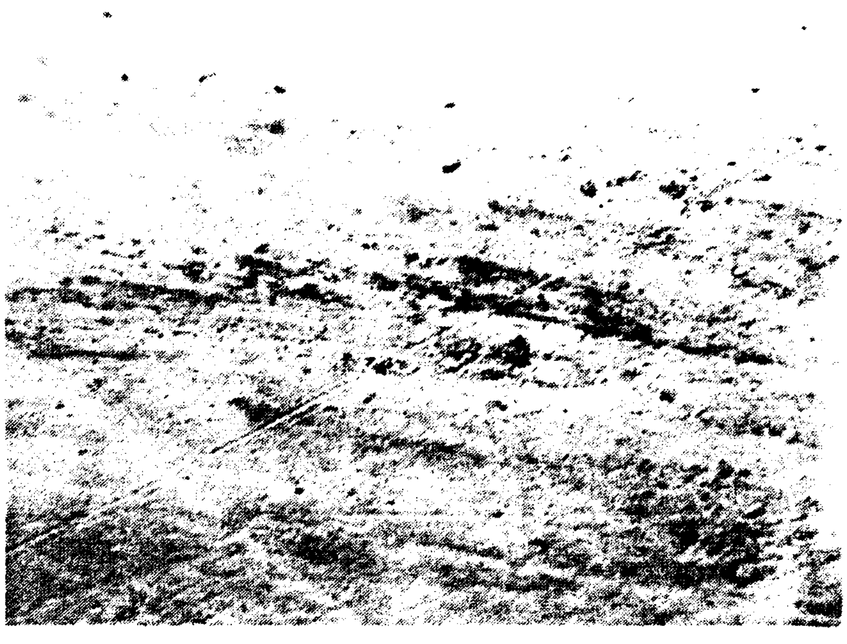

FIGURE IV-11. EXTENSIVE POLISHING AND ROUNDING OF MEDIUM SIZE STRIATIONS AND AN ABSENCE OF LARGE STRIATIONS ON THE SURFACE OF THE FIRST MANDIBULAR MOLAR, BURIAL 3 (1500x magnification).

As a group, the 3CT50 microwear patterns indicate both similarities and differences which may be ascribed to dietary change over time, seasonal variation in diet, or ideosyncratic dietary variation. The compression fractures observed on Burials 1 and 2 suggest the consumption of hickory nuts and, by extrapolation, a fall-winter occupation. Both adult burials indicate consumption oi a coarse diet prepared with stone implements which is typical of the other Baytown samples. The differences in polishing suggest the consumption of large quantities of minimally processed plant fiber by Burial 1, but none by Burial 2. This variation could be due to a change in subsistence patterns over time, seasonal variation, or the fact that the pregnant female was subject to dietary taboos. The fact that Burial 3 does not fit with the others could be due to any of the above described reasons as well as to its young age or a special social status indicated by its peculiar burial mode.

With the discovery that plants differentially discriminate against Carbon 13 during photosynthesis, bioarchaeologists were provided with the capacity of estimating the amount of maize incorporated into prehistoric North American diets (van der Merwe 1982; Bender et al. 1981; Vogel and van der Merwe 1977). Examination of Table IV-8 reveals that the two individuals from the Baytown component of the Banks site produced stable carbon isotope ratios similar to the Archaic values, which suggests no maize consumption on their parts. Similarly, the two adults from the Little Cypress Bayou site produced non-maize values (Burial 1, -22.7% and -21.9%; Burial 2, -21.1%). Burial 3, however, exhibits a high maize consuming value of -15.7%. These data suggest the absence of significant maize consumption during the Baytown period in northeast Arkansas. Further, while all the dates on burials at 3CT50 cluster between A.D. 980 and A.D. 1030 (after a dammand adjustment of 200 years for Burial 3), only the juvenile exhibits evidence of maize consumption. If all three are Mississippian, as the chronometric dates would suggest, the diet at this site seems to have remained more like that associated with Late Baytown populations.

There are three possible explanations for the maize indicating value of Burial 3. First, the temporal position of this individual may be much later than the two adults and may in fact date to the Mississippian occupation of 3CT50 when maize horticulture was well established. The fact that the molar microwear (S.E.M.) pattern of Burial 3 does not match the other two burials supports this contention. Second, maize may have been a ceremonial or elite food (suggested by the Bender et al. 1981 data) eaten by only a few select individuals during the late Baytown and Early Mississippian periods. The fact that Burial 3 represents a unique burial mode (i.e., burial in a small charnal structure) in conjunction with an anomalous molar microwear pattern suggest the possibility that this juvenile may represent a special ceremonial individual. Third, maize dependency may have occurred at some sites at particular times and not at others depending upon local subsistence choices (Spears 1978) and not enough stable carbon isotope data has been collected to recognize this pattern. Accepting or rejecting these three alternatives must await the collection of more bioarchaeological data from the late Baytown period from the Central Mississippi Valley.

TABLE IV-8. STABLE CARBON ISOTOPE RATIONS FOR THE CENTRAL MISSISSIPPI VALLEY.

Culture and Site	Burial Number	^{13}C Percent
ARCHAIC		
Scatters	1	-21.1
Lepold	-	-21.7
Billy Moore	1	-20.5
MERAMEC SPRINGS COMPLEX (WOODLAND)		
Christensen Cave	-	-19.9
Nevins Cairn	2	-20.1
Round Spring (A.D. 1000)	1	-20.7
BAYTOWN		
Banks	60-110-06	-21.5
	repeat	-21.6
	60-110-01	-21.2
Little Cypress Bayou	1	-22.7
	repeat	-21.9
	2	-21.1
	3	-15.7
EARLY MISSISSIPPIAN		
Zebree	3F	-21.2
	6	-20.5
	36	-21.2
Little Cypress Bayou	1	-22.7
	repeat	-21.9
	2	-21.1
	3	-15.7
MIDDLE MISSISSIPPIAN		
Zebree	4	-13.0
Round Spring	2	-15.6
Lilbourn	16D	-14.9
Turner	21A	-15.8
	28	-13.2
	36B	-14.1
LATE MISSISSIPPIAN		
Berry	22	-13.5
Campbell	52	-10.4
Hazel	56	-12.9

With the exceptions of the Banks and Little Cypress Bayou data, all information is from Boutton et al. 1984.

Since Little Cypress Bayou produced cultural remains and absolute dates that fit temporally within both Baytown and Early Mississippian, the site is listed under both periods for ease of comparison.

All these data provisionally support the hypothesis that the 3CT50 dietary pattern was more similar to Baytown sites and did not include the consumption of significant amounts of maize. The diet was low in carbohydrates, coarsely prepared with stone implements, and did not include maize (except for Burial 3) as a dietary staple. The consumption of hickory nuts suggests a fall-winter occupation, while the variable quantities of plant fiber indicates either temporal or seasonal variations. On the whole, the 3CT50 population resembles that of Baytown sites such as Banks, Gold Mine, and Powell Canal. In conclusion, these data provisionally support Hypothesis 1.

Hypothesis 2

The culture reflected at 3CT50 provided a high level of adaptive efficiency reflecting low stress levels, similar to Baytown groups.

Discussion

Adaptive efficiency is a concept which expresses the effectiveness with which a particular culture provides adequate adaptation of its participants to their particular ecological circumstances. The best measures of adaptive efficiency are the demographics (e.g., birth and death rates) of particular populations. Since these statistical measures are not available to the bioarchaeologist, adaptive efficiency must be estimated by relative comparisons of paleodemography, paleopathology, and nonspecific stress indicators between prehistoric skeletal series. At present, there is not enough data for paleodemographic analysis, leaving only paleopathology and nonspecific stress indicators for assessing the adaptive efficiency of a culture.

It has been demonstrated that grouping skeletal lesions into broad etiological categories (e.g., infections) can provide an excellent evaluation of the health status and subsequently the adaptive efficiency of a prehistoric group (Armelagos 1969; Lallo and Rose 1979). This procedure enables the bioarchaeologist to make both diachronic and synchronic comparisons for testing hypotheses concerning ecological variation and culture change.

Examination of Table IV-9 reveals that the two Baytown sites in the Lower Mississippi Valley exhibit a moderately high infection rate of 25 percent. However, Berg (1984) notes that the majority of these infections consist of only minor periostitis of the tibia, which is located just beneath the skin and susceptible to infections caused by minor trauma.

The Banks site is the only large sample from the Central Mississippi Valley and it exhibits an identical adult infection rate of 24 percent (Table IV-10). Again, the majority of these are minor cases of periostitis of the tibia. These rates are relatively low and

TABLE IV-9. PERCENTAGES OF PATHOLOGIES FROM THE LOWER MISSISSIPPI VALLEY.

Culture and Site		Reference	Infections		Porotic Hyperostosis	
			Subadult	Adult	Subadult	Adult
PLAQUEMINE - MISSISSIPPIAN						
Ward Place	21-I-5	Hrdlicka 1909	------	25.0 (20)	------	0.0 (25)
Myuatt Landing	23-H-3	Hrdlicka 1909	0.0 (1)	11.1 (18)	0.0 (1)	0.0 (18)
McArthur	3CH49	Powell 1983	20.0 (5)	66.7 (3)	0.0 (5)	33.3 (3)
Gordon	3AS152	Rose n.d.	0.0 (2)	18.7 (16)	0.0 (2)	31.2 (16)
Boytt's Field	3UN13	Hrdlicka 1909	------	36.0 (25)	------	4.0 (25)
COLES CREEK						
St. Gabriel	16IV128	Woodiel 1980	0.0 (10)	42.8 (7)	------	------
Lake George	21-N-1	Egratz n.d.	------	7.5 (80)	------	------
Mt. Nebo (A)	16MA18	Giardino 1977	0.0 (10)	16.7 (24)	0.0 (10)	0.0 (24)
Mt. Nebo (F)	16MA18	Giardino 1977	0.0 (13)	3.3 (30)	0.0 (13)	0.0 (30)
BAYTOWN						
Gold Mine	16RI13	Berg 1984	------	25.8 (31)	------	------
Powell Canal	3CH14	Blaeuer & Rose 1982	0.0 (2)	25.0 (4)	0.0 (2)	0.0 (4)

TABLE IV-10. PERCENTAGES OF PATHOLOGIES FROM THE CENTRAL MISSISSIPPI VALLEY.

Culture and Site		Reference	Infections		Porotic Hyperostosis	
			Subadult	Adult	Subadult	Adult
LATE MISSISSIPPIAN						
Middle Nodena	3MS3	Powell 1983	------	56.2 (16)	------	1.9 (53)
Upper Nodena	3MS4	Powell 1983	------	86.0 (43)	------	3.4 (118)
Hazel	3PO6	Rose n.d.	------	87.5 (72)	------	------
Campbell	23PM5	Spier 1955	0.0 (3)	0.0 (29)	0.0 (3)	0.0 (29)
MIDDLE MISSISSIPPIAN						
John Wilson	3LW106	Rose n.d.	66.7 (3)	33.3 (15)	0.0 (2)	0.0 (2)
Zebree	3MS20	Powell 1976	------	100.0 (1)	------	0.0 (1)
Mangrum	3CG636	Sperber 1982	0.0 (1)	0.0 (2)	0.0 (1)	0.0 (2)
Bay Village	3PO3	Rose n.d.	0.0 (1)	0.0 (1)	0.0 (1)	0.0 (1)
Burris	3CG218	Condon & Rose 1979	------	100.0 (1)	------	0.0 (1)
Floodway	3PO46	Rose n.d.	------	0.0 (1)	------	0.0 (1)
EARLY MISSISSIPPIAN						
Zebree	3MS20	Powell 1976	------	25.0 (8)	------	11.1 (9)
Little Cypress Bayou	3CT50	Rose et al. 1985	0.0 (2)	0.0 (2)	0.0 (1)	0.0 (2)
BAYTOWN						
Hyneman #2	3PO54	Rose n.d.	------	100.0 (1)	------	0.0 (1)
Hyneman #1	3PO52	Rose n.d.	------	0.0 (4)	------	0.0 (4)
Banks	3CT13-17	Rose et al. 1985	16.6 (6)	24.0 (25)	0.0 (6)	0.0 (25)
Little Cypress Bayou	3CT50	Rose et al. 1985	0.0 (2)	0.0 (2)	0.0 (1)	0.0 (2)

Since Little Cypress Bayou produced cultural remains and absolute dates that fit temporally within both Baytown and Early Mississippian, the site is listed under both periods for ease of comparison.

suggests an adequate level of adaptive efficiency for Baytown groups. The absence of infection in the small Little Cypress Bayou sample suggests conformity with Baytown groups.

Porotic hyperostosis (extensive pitting and expansion of the diploe in the cranium) has been the subject of extensive research which has demonstrated an etiological relationship between porotic hyperostosis and iron deficiency anemia associated with maize consumption (El-Najjar et al. 1976; Lallo et al. 1977; Mensforth et al. 1978). Specifically, maize is both low in iron and contains phytate which binds iron, rendering it biounavailable (El-Najjar 1976). Diets with a high proportion of maize and few alternate iron sources, such as red meat, tend to produce iron deficiency anemia and subsequent porotic hyperostosis. Although high rates of porotic hyperostosis in North America are usually associated with maize consumption, it is not simply a dietary indicator, but evidence for dietary inadequacy.

The data presented on Tables IV-9 and IV-10 indicate that porotic hyperostosis is not found among the Baytown samples. Although these data do not disprove the consumption of maize during Baytown period, they do suggest adequate nutrition as far as iron intake is concerned. Since the porotic pitting observed on Burial 1 does not fit the description of porotic hyperostosis, the 3CT50 sample is consistent with the Baytown samples even though radiocarbon dated at A.D. 1030.

Recent research has demonstrated the utility of enamel defect analysis for the reconstruction of childhood stress patterns (Huss-Ashmore et al. 1982; Cook 1981; Rudney 1981; Goodman et al. 1980; Rose et al. 1978). Dental enamel is a nonvital tissue which contains a "memory" of the body's metabolism during formation and thus enamel hypoplasias observed on adult teeth can be used to reconstruct aberations in childhood metabolism (i.e., stress).

The only available hypoplasia data from the Lower Mississippi Valley is from the Powell Canal site where the high hypoplasia rates (0.27/half year unit; 3.0/person) suggests a relatively high childhood stress level (Table IV-11). It should be pointed out that the sample size is small (n=4) and one individual contributed 42 percent of the hypoplasias (Blaeuer and Rose 1982). The hypoplasia rate from 3CT50 is twice as high (0.69/half year unit; 9.0/person) indicating greater childhood stress. Although this sample is also small, the fact that all three individuals are severely impacted suggests a situation of high childhood stress. In fact, Burial 2 exhibits the most extreme possible form of hypoplasia indicating a severe stress episode. But, again, Burial 2 was the pregnant young woman afflicted with spina bifida. However, since all three individuals exhibit high stress, the associated occupation at 3CT50 might have been in the process of culture change (i.e., from Baytown to Mississippian). Until additional data are collected from large Late Baytown and Mississippian skeletal series, high childhood stress must be considered a distinct possibility.

TABLE IV-11. PERCENT INCIDENCE OF ENAMEL HYPOPLASIAS PER ONE-HALF YEAR UNIT.

Half Year Age Intervals	Powell Canal (Blaeuer & Rose 1982)	Little Cypress Bayou (Rose et al. 1985)	Big Lake Phase Zebree (Powell 1976)	Mississippian Zebree (Powell 1976)
0.0 - 0.5	0.0 (1)	0.0 (3)	0.0 (8)	0.0 (2)
0.5 - 1.0	0.0 (1)	33.3 (3)	0.0 (8)	0.0 (2)
1.0 - 1.5	0.0 (2)	33.3 (3)	0.0 (8)	0.0 (2)
1.5 - 2.0	0.0 (3)	33.3 (3)	0.0 (8)	0.0 (2)
2.0 - 2.5	66.7 (3)	100.0 (3)	0.0 (8)	0.0 (2)
2.5 - 3.0	66.7 (3)	100.0 (3)	13.0 (8)	50.0 (2)
3.0 - 3.5	66.7 (3)	100.0 (3)	50.0 (8)	100.0 (2)
3.5 - 4.0	33.3 (3)	100.0 (3)	75.0 (8)	50.0 (2)
4.0 - 4.5	33.3 (3)	100.0 (3)	50.0 (8)	0.0 (2)
4.5 - 5.0	0.0 (3)	100.0 (3)	0.0 (8)	0.0 (2)
5.0 - 5.5	50.0 (4)	100.0 (3)	-----	-----
5.5 - 6.0	25.0 (4)	66.6 (3)	-----	-----
6.0 - 6.5	25.0 (4)	33.3 (3)	-----	-----
6.5 - 7.0	0.0 (4)	-----	-----	-----
7.0 - 7.5	0.0 (4)	-----	-----	-----
% / unit	0.27	0.69	0.19	0.20
% / person	3.0	9.0	1.6	2.0

In summary, the Little Cypress Bayou site is comparable to Baytown sites in infection and porotic hyperostosis rates which indicate acceptable adaptive efficiency and adequacy of dietary iron intake. The high hypoplasia rate at 3CT50 suggests high childhood stress during the Late Baytown/Early Mississippian periods, which could be the beginning of a general decline in adaptive efficiency.

Hypothesis 3

The adoption of maize as a dietary staple antedated the "Mississippianization" of the Central Mississippi Valley.

Discussion

The questions of when and why maize was adopted as a dietary staple in the Mississippi Valley have been the subject of considerable debate and research. Recent research has clarified our understanding of the origins of maize agriculture in the Illinois portion of the Mississippi Valley, the place of origin for the Mississippian culture. Using a number of lines of evidence from both the bioarchaeological and archaeological data base, Cook (1979) demonstrated that stress and population pressure preceded the adoption of maize horticulture during the terminal Late Woodland.

Stable carbon isotope data (Table IV-12) from this region shows a consistent isotope ratio averaging -21 percent for the early Late Woodland, Middle Woodland, and Archaic (Bender et al. 1981; van der Merwe and Vogel 1978). However, during the terminal Late Woodland the ratios decline indicating a variable but clear consumption of maize (Bender et al. 1981; van der Merwe and Vogel 1978). Cook (1979) also demonstrates that dental caries, mortality, and indicators of childhood stress increase during the same period and that adaptive efficiency does not increase until the Mississippian period. The adoption of maize, population increase, and lowered adaptive efficiency are in some way associated with the development of the Mississippian culture in this portion of the Mississippi Valley. In contrast, the relationship of "Mississippianization" and the adoption of maize as a dietary staple remain unclear in the lower portion of the Valley.

Archaeological evidence for maize prior to the Mississippian period is at best minimal, although the early use of squash and native cultigens is well documented (Byrd and Neuman 1978). A number of archaeologists have used cultural development, settlement patterns, and site locations to suggest a dependency upon maize as early as the Marksville period in the Lower Valley (Belmont 1967; Brain 1971, 1976; Haag 1978). After examining this evidence House (1982) states that "unambiguous evidence of maize cultivation is conspicuous by its absence" during the Baytown period.

Recent research in northeast Arkansas has narrowed the time frame of initial maize dependency to the late Baytown or early Mississippian periods. The Morses (Morse and Morse 1983) cite settlement patterns and the abundant remains of maize at the Zebree site to conclude that

TABLE IV-12. STABLE CARBON ISOTOPE RATIOS FOR THE CAHOKIA REGION OF THE MISSISSIPPI VALLEY.

Culture and Site	Burial No.	Sex	Status	^{13}C Percent
ARCHAIC				
Koster[1]	----	5 males	?	-21.7 $\pm$ 0.34
Reigh[2]	6C	female?	?	-21.4
	7	?	?	-21.7
	26A	male	?	-22.1
	14A	?	?	-23.1
	23A	?	?	-21.8
MIDDLE WOODLAND				
Gibson Mounds[1]	----	5 males	?	-20.9 $\pm$ 0.63
Gibson Mounds[2]	27Md5	male	high	-20.7
	30Md5	male	high	-21.3
	9Md3	male	low	-20.6
	10Md5	male	low	-21.6
	8Md3	male	?	-21.0
	26Md5	male	?	-20.7
LATE WOODLAND, EARLY				
Koster Mounds[1]	----	5 males	?	-20.9 $\pm$ 1.3
LATE WOODLAND, LATE				
Ledders Mound[1]	----	5 males	?	-18.1 $\pm$ 2.2
Ledders Mound[2]	63	female	?	-19.8
	69	female	?	-17.5
	79	female	?	-17.0
	54	male	?	-16.5
	56	male	?	-15.0
	96	male	?	-14.7
MISSISSIPPIAN				
Schild[1]	----	5 males	?	-14.1 $\pm$ 1.1
Cahokia, Md72[2]	14	male	high	-16.5
	16	?	retainer	-18.7
	55	female	sacrifice	-20.0
	72	female	sacrifice	-15.0
Fingerhut[2]	42	?	?	-15.9
	27	?	?	-15.2

[1]van der Merwe and Vogel 1978
[2]Bender et al. 1981

the appearance of Mississippian culture and maize dependency were contemporaneous in the Central Valley. In contrast, Klinger et al. (1983) report that maize and native cultigens make up the bulk of the edible flora (28.7 percent and 65.5 percent, respectively) at the late Baytown Brougham Lake site. They conclude "that the Baytown occupants were as dependent upon cultivated plant foods as the Mississippian peoples" (Klinger et al. 1983). Thus, there is disagreement as to whether maize preceded or antedated "Mississippianization" in the Central Mississippi Valley. The bioarchaeological data derived from this project can be used to suggest a resolution to this controversy.

As shown on Table IV-5, there is a consistent trend toward increased caries rates over time in the Mississippi Valley. The Marksville and Baytown sites consistently display caries rates below the 2.0 caries per person cut off rate. The Coles Creek sites from the Lower Valley either approach or pass this rubicon suggesting an increased processed carbohydrate consumption. Although these rates were originally thought to indicate maize consumption, evidence from the Alexander site suggests that the carbohydrates were derived from large quantities of native (possibly cultivated) seeds and not maize (King 1983; Rose and Marks 1983). Byrd and Neuman (1978) have also suggested that native cultigens were extensively utilized throughout the Lower Valley during the Coles Creek period. When sample size is considered, the Middle and Late Mississippian caries rates all exceed the rubicon and are clearly associated with maize consumption.

The Big Lake Phase burials from Zebree (Morse and Morse 1983) have 2.4 caries/person, a rate which exceeds the rubicon and suggests maize consumption. The 2.7 caries/person rate from the Little Cypress Bayou site exceeds Baytown rates and more resembles that from Zebree. It should be recalled that all the 3CT50 caries are small and located in either deep fissures or chipped enamel and are thus questionably indicative of high carbohydrate consumption.

However, the dental attrition scores (see Table IV-7) clearly indicate a substantial difference in the abrasive quality of the diets between the Baytown and Late Mississippian samples. Using the differences between the means (because of the small sample size and young ages at death) the 3CT50 scores are higher than the Mississippian and clearly cluster with the Banks sample. The dental microwear data can be used to document the changes in the physical properties of the diet which occurred over time.

The Baytown (Gold Mine and Powell Canal) molar surfaces are characterized as having a rough surface with large striations, numerous microstriations, a variable frequency of compression fractures, and variable moderate polishing (Blaeuer and Rose 1982). These data suggest that the Baytown diet was composed of foods coarsely processed with stone implements, minor amounts of minimally processed vegetable fibers, and seasonally available hickory nuts. And, Burial 1 from 3CT50 most closely resembles this pattern instead of one associated with Mississippian sites.

Coles Creek dentitions are characterized by a significant increase in dental attrition from the Baytown samples (Rose and Marks 1983), which is also reflected in the microwear pattern. The Alexander site molars are characterized by numerous compression fractures, large sharp striations, numerous intermediate and microstriations, and intermittent areas of polished enamel (Rose and Marks 1983). The striation size distribution and pattern in conjunction with the excessive macrowear indicates a heavy grit load which implies an increased use of stone food processing utensils from the Baytown culture. This increased use of stone utensils is consistent with the postulated switch to small seed consumption during the Coles Creek period (Byrd and Neuman 1978; King 1983).

The Big Lake phase molar surfaces from Zebree are characterized by numerous large sharp striations, numerous intermediate and microstriations, a rough enamel surface with no polishing, and a variable occurrence of compression fractures. These features indicate coarsely prepared foods using stone utensils, variable use of hickory nuts, and an absence or extensive processing of vegetable fibers. The close similarity of this pattern and Burial 2 from 3CT50 to the Coles Creek Alexander pattern suggests a continued reliance upon small seeds which could also explain the high caries rate at Zebree. The large quantity of seeds reported from the Brougham Lake site (Klinger et al. 1983) also supports this interpretation that the late Baytown and Early Mississippian cultures were dependent upon small seeds (possibly domesticated) for carbohydrates.

The Middle Mississippian molars from Zebree reflect a major change in the physical consistency of the diet from the Big Lake phase. The enamel surfaces are almost featureless and when compared to the previously described patterns show a greater than 50 percent reduction in large striations. Intermediate sized striations are also decreased and the smooth surfaces are produced by numerous microstriations. The dominant role of microstriations imply a change in food processing utensils or their use which resulted in a softer diet with only very fine mineral particles as contaminants. These Zebree molar surfaces are virtually identical to those observed from the Middle Mississippian John Wilson site. The Protohistoric Gordon site represents the culmination of this trend toward an increasingly soft highly processed diet. The enamel surfaces are smooth and the occasional large striation is obliterated by the numerous microstriations.

The stable carbon isotope ratios (see Table IV-8) from the Archaic and Woodland Central Mississippi Valley samples clearly indicate minimal to no consumption of C4 plants (Boutton et al. 1984). Similarly, the two Banks and two of the Little Cypress Bayou samples indicate no maize consumption. Despite the archaeological presence of maize, the Big Lake Phase individuals from Zebree also indicate no significant maize consumption (Boutton et al. 1984). By the Middle Mississippian maize has become a somewhat variable dietary staple, with increased maize dependency during the Late Mississippian (Boutton et al. 1984).

The above data presents a complex picture of dietary change in the Central and Lower Mississippi Valley. The caries rates, molar attrition scores, microwear patterns, and stable carbon isotope data all indicate that the Baytown diets: 1) consisted of foods coarsely prepared with stone utensils; 2) contained small amounts of minimally processed vegetable fibers; 3) was partially based on seasonal use of hickory nuts; and 4) contained no maize.

The Coles Creek diet in the Lower Valley appears to be characterized by a switch in emphasis to small seeds, either collected or domesticated. This emphasis upon small seeds also appears to be characteristic of some of the late Baytown occupations in the Central Valley.

While this bioarchaeological interpretation appears to be consistent with the data from Brougham Lake (Klinger et al. 1984), with the exception of Burial 3, the stable carbon isotope ratios from 3CT50 do not support the premise (Klinger et al. 1984) of significant maize consumption. Similarly, the stable carbon ratios from the Big Lake Phase occupation of Zebree (Boutton et al. 1984) do not support the consumption of maize despite its presence at the site (Morse and Morse 1983).

It is possible that up to 10 to 15 percent of the carbon intake could derive from maize and not be revealed in the stable carbon isotope ratios. However, the values from Banks, Big Creek, and Zebree are so similar to the Archaic values that this seems unlikely. There is no question that both the late Baytown and Big Lake phase peoples were growing maize, but the biological evidence overwhelmingly indicates that maize was not a dietary staple. The data from Illinois is instructive here. Although the terminal Late Woodland people at Ledders were consuming maize, the males consumed more than the females, indicating that when maize was first introduced it was a high status food (Bender et al. 1981). If maize horticulture is imported into the Central Valley as part of the Mississippian complex, it is possible that it retained its status connotation and was used as only an elite or ceremonial food. This could explain its appearance at Zebree without an impact on the stable carbon ratios. This could also explain the one 3CT50 individual (Burial 3) with the high maize consumption, peculiar dental wear, and aberrant burial pattern. This interpretation would also apply to Brougham Lake if maize and other non-material Mississippian traits were imported prior to changes in the ceramics and house forms.

The dental data suggest that a small seed focus, similar to Coles Creek further to the south, continued through the late Baytown into the Early Mississippian in the Central Valley. This interpretation is supported by the fact that neither the microwear, stable carbon ratios, nor caries rates change until the Middle Mississippian. Given the abundant resources, extensive floodplain, and dispersed settlement pattern of the late Baytown and Early Mississippian of the Central Valley (Morse and Morse 1983), it is probable that the dietary base

(which included small seeds) was sufficient and that maize dependency was not required until the Middle Mississippian with its more focalized settlement pattern.

In conclusion, this bioarchaeological analysis suggested that although maize may have preceded complete "Mississippianization" in the Central Valley, a major subsistence shift did not occur until the Middle Mississippian. Unlike the Illinois region, where population pressure and lowered adaptive efficiency stimulated a subsistence shift to maize horticulture, these forces were not active in northeast Arkansas. Thus, the bioarchaeological data support this hypothesis and indicate that, although maize is present during the late Baytown and Early Mississippian of the Central Valley, "Mississippianization" did not include a major subsistence shift until the Middle Mississippian.

Hypothesis 4

Using the Lower Illinois Valley as a model, the greatest period of stress and lowest level of adaptive efficiency should precede the adoption of maize as a dietary staple and "Mississippianization" of the Central Mississippi Valley.

Discussion

Cook (1979), summarizing both the archaeological and bioarchaeological data from the Lower Illinois Valley, documents an increase in population density, mortality, morbidity, and childhood stress prior to the adoption of maize and the development of the Mississippian in the terminal Late Woodland. The previous discussion suggests that a major subsistence shift did not occur until the Middle Mississippian in the Central Mississippi Valley. The question to be considered here is where in the Central Valley sequence is the evidence for a decline in adaptive efficiency.

As shown on Table IV-9, there is a fairly constant infection rate over time in the Lower Valley. The two Baytown sites exhibit a moderate infection rate (25 percent), which is composed primarily of minor tibial periostitis (Berg 1984). With the exception of St. Gabriel, the Coles Creek rates show a slight decline. The unusually high rate at St. Gabriel might be explained by a ubiquitous treponematosis postulated for the Coles Creek Morton Shell Mound skeletal series (Robbins 1978). It is possible that the lush warm environment of the southern portion of the Lower Valley might have harbored many pathogens which produced numerous minor infections associated with trauma. This would explain the lower rates for the more northern Coles Creek peoples. The Plaquemine and Mississippian sites show a variable, but minor increase in infections. These data could indicate a lower adaptive efficiency during these cultural periods, but the temporal placement of the skeletons is not sufficiently precise to pinpoint the event.

A very different infection rate trend characterizes the Central Mississippi Valley (see Table IV-10). Taken as a group, the Baytown rates are identical to those of the Lower Valley. An identical rate is found at the Early Mississippian occupation of Zebree and a slight, although insignificant, rise is observed in the Middle Mississippian. The Late Mississippian shows a significant rise in infection rates at three of the four available sites. This infection increase during the Late Mississippian indicates increased susceptibility and an increased pathogen contact. The increased contact can be attributed to higher population density, more permanent residence, and the accumulation of large quantities of waste in the vicinity of the habitation areas (Morse and Morse 1983). Thus, these data suggest that the only period of decreased adaptive efficiency is during the Late Mississippian and accompanies significant socio-cultural change. At present, this conclusion must remain tentative until larger skeletal series from the earlier time periods are examined.

Evidence for porotic hyperostosis in the Lower Valley is restricted to one Plaquemine and one Mississippian site (see Table IV-9). Thus, iron deficiency anemia was not present until maize became a major dietary staple late in the Lower Valley sequence. With the exception of one Big Lake Zebree individual, porotic hyperostosis does not show up until the Late Mississippian in the Central Valley (see Table IV-10). This one individual does not, however, support a thesis of widespread iron deficiency during the Early Mississippian; only larger samples would permit a more definitive conclusion to be drawn.

Unfortunately, there is enamel hypoplasia data from only four sites (see Table IV-11). The increase in childhood stress between the Powell Canal and Big Creek sites implies a decline in adaptive efficiency. More significant is the fact that childhood stress begins at a younger age at the Little Cypress Bayou site. The lowest levels of childhood stress and the most restricted ages of stress are found at both the Early and Middle Mississippian Zebree occupations. This small quantity of data suggests a high stress episode during the late Baytown, which is ameliorated during the Mississippian. This model of childhood stress corresponds to the Illinois data and contradicts the conclusions derived from the infectious diseases.

In conclusion, the data from the Central Mississippi Valley are not sufficient for a valid test of this hypothesis. However, the adult infection rates do suggest that lowered adaptive efficiency did not precede "Mississippianization," but in fact, developed only with population aggregation during the Late Mississippian. Porotic hyperostosis never became an important condition which implies that, despite the adoption of maize, other sources of dietary iron (e.g., red meat) were always abundant. The hypoplasia data, on the other hand, suggest a rise in childhood stress during the late Baytown or Early Mississippian, but more data are required to substantiate this conclusion.

At the present time this hypothesis is not supported and other casual hypotheses should be developed. Since the Mississippian culture is an import into the Central Valley and not the product of indigenous development, the Illinois model may not be appropriate here. Bioarchaeological data from Dickson Mounds, where a Late Woodland population is "Mississippianized," shows that the greatest period of stress and lowered adaptive efficiency occurs during the fully developed Mississippian occupation (Goodman et al. 1980; Lallo and Rose 1979; Lallo et al. 1978). A similar model may be appropriate for the Central Valley, where a broad floodplain, abundant resources and a dispersed settlement pattern provided adequate adaptive efficiency until population aggregation occurred.

SUMMARY

A total of four burials were excavated from the Little Cypress Bayou site: Burial 1, a 30 to 35 year old male; Burial 2, a 22 to 24 year old female with fetus; Burial 3, a 12 year old juvenile; and Burial 4, an adult of unknown sex. The only major pathologies are a severe hypoplasia and spina bifida (Burial 2). Burial 2 was also carrying a fetus in its seventh month at her death.

Dental caries, molar macrowear, microwear, and stable carbon isotope ratios all indicate that the diet of the occupation at 3CT50 was similar to Baytown occupations. The diet was moderate to low in carbohydrates, coarsely prepared with stone utensils, and contained hickory nuts and variable quantities of unprocessed plant fiber. Burial 3 is this exception to this pattern, exhibiting dental caries, an abnormal microwear pattern, and a stable carbon isotope ratio all indicating significant maize consumption. This individual could be temporally misplaced. It is also possible that maize with a documented presence during late Baytown could have been a ceremonial or elite food eaten only by a select few. The unique burial mode of this individual could indicate that Burial 3 belonged to this social category.

The presence of maize has been documented from both the late Baytown (Klinger et al. 1983) and Early Mississippian (Morse and Morse 1983) occupations in the Central Mississippi Valley. However, both the caries and stable carbon isotope ratios indicate that maize did not become a universal dietary staple until the Middle Mississippian. Supporting evidence derived from the Zebree microwear patterns suggests that no major dietary shift occurred until the Middle Mississippian. It is postulated that the small seed focus subsistence pattern (similar to that postulated for Coles Creek), developed during the Baytown period, continued until the Middle Mississippian. As a result, although maize cultivation was known and occasionally practiced, this subsistence pattern was sufficient to provide adequate nutrition. Maize may have been only a minor (i.e., unmeasurable) dietary supplement or an elite/ceremonial food. These data suggest that "Mississippianization" of the Central Valley did not necessarily coincide with a major subsistence pattern change.

In general, the adaptive efficiency level of the 3CT50 occupation appears to be moderately high and more typical of Baytown populations. The one exception is the hypoplasia frequencies which suggest a possible increase in childhood stress during the Late Baytown/Early Mississippian periods. Analysis of the paleopathology data from all the Central and Lower Valley sites indicates that the only significant decline in adaptive efficiency occurred during the Late Mississippian when population aggregation occurred. This pattern is significantly different from the Illinois portion of the Mississippi Valley where adaptive efficiency declined prior to the adoption of maize as a dietary staple and the development of the Mississippian culture. It is postulated that the adaptive strategy and abundant resources of the Central Valley were sufficient to provide adequate nutrition and health without relying upon maize agriculture.

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APPENDIX V

ANALYSIS OF BOTANICAL MICROFOSSILS FROM 3CT50

by

Glen C. Fredlund
Steven Bozarth

Introduction

Pollen, opal phytoliths, and carbonized plant microfossils were isolated from sediment samples taken at 3CT50 (the Little Cypress Bayou Site), for the purposes of paleovegetational reconstruction and paleoethnobotanical interpretation. Preservational problems precluded the quantitative interpretation of pollen assemblages from this site. Pollen, together with opal phytoliths and microscopic carbonized plant remains, did provide minimal qualitative information on local, site specific, paleovegetation, however. Most encouraging was the recovery of *Zea maize*-like and Cucurbitaceae-like phytolith forms from several of the cultural features investigated. Though a great deal of work is yet needed in order to confidently link specific phytolith forms with cultigens, these preliminary data can be used to corroborate macrobotanical evidence.

Samples

Thirteen archaeological feature fill and sediment samples were processed in total. A column of five pollen samples taken in contiguous 10 cm intervals from the east profile of the Midden Block 3 excavation was analyzed in hopes of finding a chronological trend

related to local or regional vegetation change. Three additional stratigraphic pollen samples taken from the east profile of Backhoe Trench 5 were also analyzed. In addition to providing another stratigraphic record, these three samples were investigated in connection with problems of geomorphology.

Samples from five basin-shaped archaeological features were investigated for pollen, spores, phytoliths, and carbonized microfossils (Table V-1).

TABLE V-1. ARCHAEOLOGICAL FEATURE SAMPLES ANALYZED

Feature Number	Portion of Feature Sampled
28	North half
50	South half, level 1
86	East half, zone A
306	North half
659	East half, sample 5

The botanical microfossils occurring in these features are most likely to be culturally derived or affected by cultural modification of the local environment. Pollen recovered from such situations is probably highly variable and not directly reflective of regional vegetation (Hevly 1981). Pollen, phytoliths, and carbonized microfossils probably do reflect the local environment on a qualitative (presence/absence) level.

The primary impetus for the investigation of the fill of these basin-shaped features was the identification of economically important plants in a well documented cultural context. In part, the feature fill may have resulted from the primary function of these features, but this cannot be assumed. It must be recognized that the fill may have resulted from secondary use of the feature including refuge disposal (simply the backfilling of the features after their abandonment). Therefore, the botanical microfossils recovered from the fill are not necessarily related to the use of the feature. It may be possible, with repeated detailed studies on culturally related sites, to more confidently identify economically important plants. The preliminary studies carried out here are encouraging, especially for phytoliths. Although we cannot be sure that the presence of botanical microfossils recovered in these samples is the result of prehistoric utilization, we can relate them with more confidence to the time of occupation of the site.

Laboratory Methods

A heavy liquid flotation procedure (Johnson and Fredlund 1984) was used for the recovery of pollen, phytoliths, and other botanical

microfossils from the 3CT50 samples. The high clay content of the sediments presented some special problems. The floculation of clays around larger particles including pollen and phytoliths can trap them in the sediments and affect their recovery by heavy liquid flotation. We have some indication that differential recovery of pollen may result from this phenomenon. It appears that certain pollen taxa may be more readily trapped than others due to their size and morphology. Differential recovery of pollen taxa would preclude quantitative interpretation of relative frequencies. To insure that this was not occurring, several modifications were made in the standard extraction procedure. The pollen extraction procedure used was as follows:

1. Approximately 100 gm of sediment were treated with dilute (10 percent) hydrochloric acid. The samples were balanced, stirred, centrifuged, and the supernatant decanted (hereafter BSCD).

2. Sodium hexametaphosphate (0.1 molar solution) was added as a clay dispersant; BSCD.

3. Zinc bromide ($ZnBr_2$), a water solution, heavy liquid at specific gravity 1.95 was used to float the pollen and other light organics out of the heavier, clastic sediment fraction. Because of the clay problem, a volumetric ratio of four parts $ZnBr_2$ to one part sediment was used to obtain a better separation of pollen. The sediment-heavy liquid solution was homogenized and centrifuged at 1500 rpm's for 30 minutes and the decanted liquid retained. Monitoring of the specific gravity of this pollen-bearing supernatant is essential. If it was found that the specific gravity of this liquid had been diluted to below 1.95, the flotation sample was repeated. Smears of the heavy, clastic fraction of each sample were also checked microscopically for pollen. If pollen was found, the flotation procedure was repeated.

4. The $ZnBr_2$ solution containing the pollen was diluted to specific gravity 1.3 and centrifuged at high speeds in order to recover the pollen. After centrifugation, the diluted $ZnBr_2$ was drawn through a seven-micron filter membrane. If the recovered material was found to contain pollen it was back-washed into the pollen bearing residue. The $ZnBr_2$ was saved for recycling.

5. Because of the high organic content of these archaeological samples it was necessary to use an oxidizing reagent. A 10 percent solution of potassium hydroxide (KOH) was used at room temperature for ten minutes to oxidize some of these unwanted organics; BSCD.

6. The KOH treatment was followed by distilled water washes and BSCD until the samples had cleared.

7. The residue was then dehydrated using butanol and stored in vials and mounted on microscope slides in silicon fluid (2000 c.s.).

The procedure for the extraction of phytoliths was essentially the same but employed heavier $ZnBr_2$ (specific gravity 2.35) and a smaller subsample.

Regional Palynological Record

Several sites provide palynological data for the reconstruction of pre-Euroamerican settlement vegetation of the region and a basis for the evaluation of pollen data from 3CT50. The oldest Quaternary pollen record from the Mississippi Embayment comes from the nearby Nonconnah Creek site (Delcourt et al. 1980). This record documents the changes in vegetation during the late Pleistocene until about 13,000 B.P. The record is incomplete after this time. This Wisconsinan-age record indicates that a refugal mesic deciduous forest of the Mississippi River blufflands persisted even during the glacial maximum. Spruce and jack pine were additional important forest elements of the region until approximately 12,500 B.P. (Delcourt et al. 1980).

Recently, Smith (1984) has reported a continuous 17,000 year record from southeastern Missouri. This Ozark uplands record revealed that some of the deciduous arboreal taxa, as well as the jack pine and spruce forests, extended west of the Mississippi during the Wisconsinan glacial. This record also provides the first evidence for a mid-Holocene (Hypsithermal) oak-savanna in the Ozark uplands. Not until approximately 3500 B.P. did the southern shortleaf pines become an important constituent of the Ozark forests (cf. Albert 1981 for the Ouachita and Jack Fork uplands forests).

The Old Field, Missouri, site (King and Allen 1977) contained a 9000 year record for the border between the Ozark uplands and Mississippi bottomlands. The pollen record at this site is dominated by oak and grass pollen during the mid-Holocene (Hypsithermal). Arboreal species diversity and indicators of swamp vegetation remain low at Old Field until about 6000 B.P. This may be a reflection of the expansion of the Prairie Peninsula documented elsewhere in the Midwest or the development of a different local vegetation (i.e., canebreaks) during this period. By about 5000 B.P. a diversity of arboreal and non-arboreal pollen taxa again become important at the site.

The pollen record most germane to the research at 3CT50 comes from Big Lake of the St. Francis Sunk Lands approximately 80.4 km (50 mi) north of Memphis (King 1978). The record from this lake spans the period of Euroamerican settlement and development of the region in the 19th century. A major decline in the relative frequency of oak pollen in this record is probably due to the logging of hardwoods and clearing of the river bottomlands for agriculture. Curiously, this decline in oak is not accompanied by an increase in ragweed (*Ambrosia*) pollen characteristic of clearing and agriculture elsewhere. The record does contain a marked increase in another vegetation disturbance indicator, Cheno-Am type pollen, at this level.

These records provide both a chronological framework and a basis for evaluating the 3CT50 pollen data. The St. Francis Sunk Lands

record (King 1978), along with regional studies of modern pollen frequencies (Delcourt et al. 1983), establish the essential analog needed for translating pollen assemblages into vegetation.

Pollen from 3CT50

Although pollen was found in every sample, problems of preservation and recovery precluded quantitative analysis. The pollen taxa identified in each sample are shown in Table V-2. Not surprising is the diversity of pollen taxa from the upper samples of the midden and backhoe trench. Both of these samples are from within the modern plow zone. Below the plow zone pollen diversity and concentration fall off drastically. This is apparently the result of progressive chemical degradation occurring after the time of deposition (Hall 1981).

TABLE V-2. POLLEN TAXA PRESENT IN 3CT50 STRATIGRAPHIC SAMPLES.

Pollen Taxa	Midden Block 3, E. Profile (cm below surface)					Backhoe Trench		
	0-10	10-20	20-30	30-40	40-50	plow zone	upper stratum	lower stratum
AP								
Pinus	X	X		X	X	X	X	X
Quercus	X	X	X			X		
Carya	X					X		
Ulmus						X		
Taxodium	X					X		
Platanus						X		
Populus	X					X		
Salix	X							
Acer	X							
Tilia						X		
Fraxinus	X					X		
Liquidamdar						X		
Morus						X		
Celtis	X					X		
NAP								
Ambrosia	X	X				X	X	
Other Asteraceae	X					X		
Poaceae	X	X				X		
Cheno-Am type	X	X	X			X	X	
Cannabis-Humulus						X		
Polygonum	X					X		
Cyperaceae	X					X		
Other NAP	X					X		
No. of taxa	16	5	2	1	1	20	3	1

Most of the pollen from the plow zone samples is probably modern. The list of taxa recovered is similar to that reported from the St. Francis Sunk Lands (King 1978). Both of these upper level samples contained substantial amounts of ragweed (Ambrosia) and Cheno-Am type pollen, indicators of agricultural disturbance of the area vegetation. A single grain of Cannabis-Humulus type pollen was also observed from the upper sample from the backhoe trench. Cannabis is an introduced plant widely grown in the region historically for its fiber and is an important indicator of Euroamerican settlement and agriculture in some pollen records. Humulus (hops), a closely related native plant, produces pollen essentially indistinguishable from Cannabis. However, the occurrence of this pollen taxon together with the abundance of other agricultural disturbance indicators suggests that the pollen in these samples is of modern origin.

Pollen preservation in the archaeological features at 3CT50 was also poor. Features 28, 86, and 306 were totally barren of pollen. Features 50, 128, and 659 did contain some poorly preserved pollen. Only Pinus, Ambrosia type, and Cheno-Am type pollen were observed in these samples. This pollen may be the result of downward translocation of modern pollen by pedogenic processes (Keatinge 1983; Havinga 1974; Dimbleby 1957, 1961a, 1961b).

Silicified and Carbonized Plant Cell Analysis

The samples from the six archaeological features were also analyzed for opal phytoliths (silicified) and carbonized plant cells. Phytoliths are microscopic opaline silica bodies formed by the precipitation of silica within and among the living cells lants (Smithson 1956; Blackman 1971). Because of their morpnological consonance, taxonomic significance, and persistence in terrestrial sediments they have great potential in both paleoenvironmental and paleo-ethnobotanical research (Rovner 1971, 1983). At 3CT50 the focus was on the ethnobotanically important phytoliths characteristic of cultigens.

Phytolith research in the Americas has focused primarily on the identification of Zea maize (Piperno 1984; Miksicek and Stone 1981; Pearsall 1978, 1982). Recently, however, other cultigens have also been investigated for characteristic phytolith forms (Bozarth 1984; Piperno 1983). Phytoliths with distinctive, scalloped surfaces have been isolated from the rind of a number of cucurbit species (Bozarth 1984). This form appears to be unique to the genus Cucurbita. It is unlike any previously described for any plant. Because it comes from that portion of the plant most likely to have been brought into an agricultural village, the fruit, it is of considerable importance for the recognition of this plant taxon in the archaeological record. Other cultigens now being investigated hold some promise of producing identifiable phytolith forms, but at 3CT50 the identification of maize and cucurbit phytoliths was of primary interest.

The majority of the phytolith forms encountered in the 3CT50 feature samples can be attributed to mixed deciduous forest vegetation

which characterized the Mississippi embayment bottomland prior to clearing for modern agriculture (Geis 1973; Wilding and Drees 1973). Identification of microscopic carbonized wood fragments from these same sample residues agrees with this interpretation of the phytoliths. Fragments of angiosperm pitted vessels (Figures V-1 and V-2), such as occur in Quercus (oak), and groupings of dicot leaf epidermal cells (Figures V-3 and V-4) were common in these feature samples. Also present were carbonized coniferous (cf. Pinus) xylem cells (Figures V-5 and V-6), suggesting use of these woods at the site.

Non-arboreal phytolith types were also common. Silicified cells characteristic of grasses and other monocots (e.g., sedges and cattail) were the most common. Silicified bulliform cells (Figure V-7) and dumbbell (or bilobate) forms (Figure V-8) are representative of this group of phytoliths. It is impossible to judge whether these phytoliths represent natural vegetation of the site or culturally significant plants.

Several possible cultigen phytolith forms were found in the 3CT50 feature samples. A silicified tracheid with spiral thickenings and a width of 23 microns was found in Feature 659 (Figure V-9). Similar phytolith forms (Figure V-10) have been found to occur in significant numbers in the cobs of several traditional maize varieties. These Zea forms range in width from 15 to 35 microns. However, silicified tracheids with spiral thickenings have also been found in some non-cultigens (Rovner 1971, 1983). Typically these non-cultigen, spiral tracheids are smaller (maximum width 23 microns); therefore, it appears possible that this phytolith form may represent the presence of maize.

A search for characteristic cross-shaped maize phytoliths (Pearsall 1978) was also made on all feature sample residues. Like the silicified tracheids, this phytolith form also occurs in non-cultigens in low frequencies (Piperno 1984). However, in archaeological samples where the presence of maize is confirmed by macro-fossil and pollen evidence, cross-shaped phytoliths occur in abundance, but occur only occasionally in archaeological samples from pre-maize agriculture sites (Piperno 1984).

Several cross-shaped phytoliths were found in the Feature 659 sample. The ratio of dumbbell to cross-shaped phytoliths in this sample was found to be about 20:1. This is significantly higher than the 3:1 ratio typical of archaeological samples where cross-shaped phytoliths are abundant and maize is known to occur (Piperno 1984). The presence of Zea maize in Feature 659, although suggested, cannot be definitely proven by the phytolith data alone.

Two cucurbit-like phytoliths were found, one in Feature 50 (Figure V-11) and another in Feature 659 (Figure V-12). The archaeological specimens compare favorably with forms isolated from domesticated squash rinds (Figures V-13 and V-14). As noted above, these phytolith forms have been found in no plants outside the genus Cucurbita. They

FIGURE V-1. CARBONIZED ANGIOSPERM PITTED VESSEL, FEATURE 659.

FIGURE V-2. CARBONIZED ANGIOSPERM VESSEL, FEATURE 50.

FIGURE V-3. DICOTYLEDON LEAF EPIDERMAL CELLS, FEATURE 50.

FIGURE V-4. DICOTYLEDON LEAF EPIDERMAL CELLS, FEATURE 659.

FIGURE V-5. CARBONIZED CONIFEROUS XYLEM CELLS, FEATURE 28.

FIGURE V-6. CARBONIZED CONIFEROUS XYLEM CELLS, FEATURE 50.

FIGURE V-7. SILICIFIED BULLIFORM CELLS, FEATURE 659.

FIGURE V-8. DUMBBELL-SHAPED PHYTOLITH, FEATURE 659.

FIGURE V-9. MAIZE-LIKE SILICIFIED TRACHEID, FEATURE 659.

FIGURE V-10. SILICIFIED TRACHEID FROM ZEA MAIZE.

FIGURE V-11. CUCURBIT-LIKE PHYTOLITH, FEATURE 50.

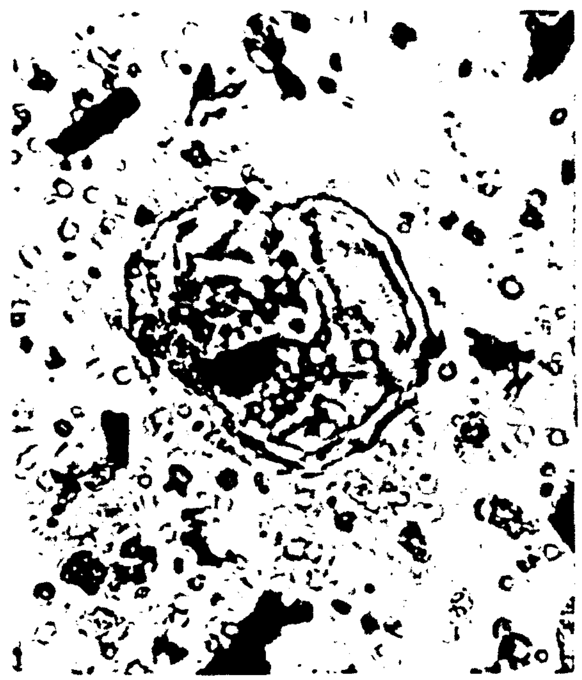

FIGURE V-12. CUCURBIT-LIKE PHYTOLITH, FEATURE 659.

FIGURE V-13. MODERN PHYTOLITH FROM CUCURBITA PEPO RIND.

FIGURE V-14. MODERN PHYTOLITH FROM CUCURBITA MAXIMA RIND.

do occur in non-domesticated, native species from this genera (e.g., Cucurbita foetidissima, Bozarth 1984). Given the cultural context of 3CT50, a site well within the geographical and chronological limits of domesticated cucurbits (Ford 1981; Chomko and Crawford 1978), it seems likely that the presence of these unique phytolith forms in more than one sample indicates the cultivation of squash by the peoples of this site.

Conclusion

The analysis of pollen, opal phytoliths, and carbonized plant microfossils from 3CT50 produced few surprises in the paleoenvironmental indicators recognized. The majority of the microfossils indicated a mixed deciduous forest and cypress swamps typical of the Mississippi bottomlands before modern agriculture. Only the occurrence of microscopic wood fragments of pine seem incongruous. These wood fragments may indicate that some pine was present on favorable soils even within the Mississippi River floodplain at the time of occupation of 3CT50. It is also possible that their presence may represent some cultural preference and longer range transportation. Overall, however, typical late Holocene floodplain vegetation is evidenced in the micro-botanical record.

There is evidence for the cultivation of both corn (Zea maize) and squash (Cucurbita sp.). The evidence for cucurbits seems the stronger

of the two. Since no known source for phytoliths of a similar form has been documented, it seems likely that these microscopic silicate bodies represent the use of squash. Both of the forms of maize-like phytoliths can be found in non-cultigens. However, their co-occurrence in the same sample is suggestive of prehistoric cultivation of the plant at the site.

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APPENDIX VI

RADIOCARBON DATES

Samples for radiocarbon analysis were submitted to Dicarb Radioisotope Company, Norman, Oklahoma and the Radiocarbon Laboratory, Institute for the Study of Earth and Man, Southern Methodist University. Detailed procedures of the process are available upon request from each laboratory. The results are presented on Table VI-1. All original printouts will be submitted to the curating agency upon completion of the project.

TABLE VI-1. RADIOCARBON DATES.

Laboratory	Sample Number	Provenience	Radiocarbon Dates
Dicarb	DIC-2896	Burial 1	920 B.P.± 65/A.D. 1030 C12/C13 ratio: -22.7
SMU	SMU 1303 (Bone collagen)	Burial 2 (Feature 905)	Point Estimate: 970 B.P. ± 72/A.D. 980(Age corrected for tree-ring calibration using third order polynomial [Ralph and Michael 1974])
	SMU 1296 (Bone fragments; apatite fraction)	Burial 2 (Feature 905)	Point Estimate: 737 B.P.± 80/ A.D. 1213. (Age corrected for tree-ring calibration using third order polynomial [Ralph and Michael 1974])
Dicarb	DIC-2897	Burial 3 (Feature 654)	750 B.P.± 65/A.D. 1200--corrected to A.D. 1000 C12/C13 ratio: -15.7 [Note: Irene Stehle indicates that, based on C12/C13 ratio, which suggests high maize consumption on the part of the individual, a 200 year correction (to A.D. 1000) should be made.]
SMU	SMU 1298 (silty charcoal w/humates)	Feature 28	Point Estimate: 1304 B.P.± 82/ A.D. 646. (Age corrected for tree-ring calibration using third order polynomial [Ralph and Michael 1974])
SMU	SMU 1299 (charcoal)	Feature 376	Point Estimate: 1315 ± 76/ A.D. 635. (Age corrected for tree-ring calibration using third order polynomial [Ralph and Michael 1974])

APPENDIX VII

ARCHEOMAGNETIC RESULTS FROM SAMPLES COLLECTED AT 3CT50

by
Daniel Wolfman

Archeomagnetic dating is capable of providing very precise and accurate results. This method has been discussed in a number of recent publications (e.g., Aitken 1974; Eighmy et al. 1980; Wolfman 1982). In the discussion which follows it is assumed that the reader is familiar with the information in the most recent of these three references. A comprehensive review article on archeomagnetic method, theory, and results will be published early next year (Wolfman 1984).

The first archeomagnetic work in the United States was undertaken in the Southwest. Research in this area since 1962 has led to the construction of a polar curve for the time period A.D. 600 - 1500 (DuBois and Wolfman 1970; DuBois 1975). Subsequent work (Eighmy et al. 1980; Sternberg 1982) suggests that the configuration and calibration of the A.D. 1200 - 1400 portion of the curve is accurate. However, some revision of the calibration and perhaps configuration of some portions of the earlier section may be needed (Sternberg and McGuire 1981; Sternberg 1982; Hathaway et al. 1983). Unfortunately, in these recent studies almost no samples in the A.D. 1400 - 1500 age range have been collected.

The archeomagnetic work in the Southwest was followed by the development of a polar curve for Mesoamerica for the time period A.D. 1 - 1075 (Wolfman 1973, 1983).

Archeomagnetic investigations supported by the Arkansas Archeological Survey in Arkansas and the border areas of adjacent states have been undertaken since 1974. The results obtained on the first 51 samples measured (37 of which had alpha-95 values less than 4°) led to the construction of a polar curve for the A.D. 1200 - 1500 time period which is very similar to the curve for the Southwest for the same interval (Wolfman 1979; 1982). [Alpha-95 ($_{95}$) is the half angle of a circular cone such that there is a 95 percent chance that the true mean lies within that cone. Consequently, it is a measure of the dispersion of the specimen directions in a sample (see Wolfman 1982:279).] As is usually the case those results with alpha-95 values less than 4° are quite accurate. All but two of the pole positions for the 35 samples dating between ca. A.D. 1200 and 1500 with alpha-95 values less than 4° are along the path of the curve with little random scatter. Samples of the same age cluster well and the virtual geomagnetic pole (VGP) positions obtained from stratigraphically related samples occur in the order expected. Results obtained from approximately 30 Arkansas samples measured since the publication of the 1982 article are also of high quality (Wolfman n.d.). While the great majority of these samples date between A.D. 1200 and 1500 the data obtained from five of them provide a preliminary indication of the configuration of the curve between ca. A.D. 1150 and 1200.

Thus far, very few samples older than A.D. 1150 have been collected in Arkansas and the border areas of adjacent states. The excavation of 3CT50, a Baytown period site (dating ca. A.D. 400 - 700) provided a rare opportunity to collect a large group of samples of this age. During the course of the work at this site many features which showed some indication of having been baked were uncovered. The results from archeomagnetic samples collected from such features were expected to provide data for developing the curve for Arkansas and portions of adjacent states in this time range.

In addition, due to the high precision of archeomagnetic dating it was reasonable to expect that if there was a spread of as little as 50 to 75 years in age of the features sampled that relative dating of at least some of them would be obtained. It was further hoped that comparison of the archeomagnetic data obtained from the 3CT50 samples with the curves and data from the Southwest and Mesoamerica might give some indication of the absolute ages of the features sampled at 3CT50.

Archeomagnetic collections were made at 3CT50 on April 1-3, 1983. Six to eight oriented specimens were collected from seven baked features. The samples were measured using a 3-axis SCT cryogenic magnetometer (Goree and Fuller 1976) in the paleomagnetism laboratory at the University of Pittsburgh. The stability of the remnant magnetism in the samples was determined using A.F. demagnetization. The procedures used have been described by Wolfman (1982:284-285; 289).

Despite the fact that the features from which the samples were collected appeared to be undisturbed and very well baked, as indicated by oxidation of the soil, the precision of the results obtained from

the seven samples collected at 3CT50 are unusually poor. Only two of them have alpha-95 values less than 4° (see Table VII-1). Samples collected from similar baked features usually (ca. 75 percent to 80 percent of the time) give precise results (i.e., alpha-95 less than 4°).

Due to the shallow depth of the baked features two possible explanations for the poor results seem possible. Although the well baked features appeared to be intact, it is conceivable that these shallowly buried features were slightly disturbed during plowing. In addition, when I visited the site the ground was thoroughly saturated. It was reported that since the baked features had been excavated the ground had been soaked and dried out several times. Large cracks appeared in the soil following drying. All soil in Arkansas is subject to some expansion and contraction and reliable archeomagnetic results have been obtained throughout the state. Consequently, prior to the work at 3CT50 it was assumed that errors due to this source would be small or non-existent. However, the unusually large amount of soil expansion and contraction at 3CT50, particularly after excavation but prior to sample collection, may have disturbed the soil sufficiently to cause the poor results. While the possibility of some effects from the New Madrid earthquake cannot be entirely eliminated, the absence of visible damage to the features suggests that errors due to this source are unlikely. Other explanations such as collecting or laboratory error seem extremely unlikely.

Since a curve for the A.D. 400 - 700 time period has not yet been developed in Arkansas, absolute archeomagnetic dating cannot be obtained in this time period. However, varying degrees of similarity through time are to be expected between the curves from different parts of North America. As noted above, the Southwest and Arkansas curves are remarkably similar in the A.D. 1200 - 1500 time period. In contrast, the Southwest and Mesoamerican curves between A.D. 600 and 1075 show only a general similarity in configuration but exhibit significant differences in detail. Thus far, Mesoamerica is the only area on the North American continent for which a polar curve in the A.D. 400 - 700 time period has been developed. The degree of similarity of the Arkansas curve to the Mesoamerican curve dating the ca. A.D. 400 - 700 time period, of course, can only be determined when more data from Arkansas are available.

At this time there is little A.D. 400 - 700 archeomagnetic data available for the Southwest. What there is differs from both the Mesoamerican curve and the 3CT50 results. Since the various polar curves cross over each other and themselves, it is not surprising that the 3CT50 VGP positions are close to later (post A.D. 700) portions of the Southwest and Arkansas curves. These associations are apparently fortuitous and will not be discussed here. On the other hand, despite the poor precision of the results, five of the 3CT50 VGPs plot very close to the Mesoamerican curve between A.D. 575 and 750 with three of them clustered between ca. A.D. 620 and 640 (Figure VII-1). It should be noted that while accurate results are usually precise it is conceivable that a baked feature could be disturbed in manner such that

TABLE VII-1. ARCHEOMAGNETIC RESULTS FROM 3CT50.

Sample No.	Provenience	VGP Lat.	VGP Long.	Alpha-95	Sigma-p	Sigma-m	N	Demag
CT201	Feature 376	86.7	146.0	3.5	3.3	4.8	8/8	NRM
CT202	Feature 28 (Seg. B)	81.2	69.0	5.8	4.7	7.4	8/8	500
CT203	Feature 295	81.8	127.4	6.8	5.8	8.9	6/6	500
CT204	Feature 294	80.8	156.3	10.6	9.6	14.2	6/6	NRM
CT205	Feature 316	78.1	-178.2	5.6	5.6	7.9	8/8	100
CT206	Feature 317	72.0	139.8	7.8	5.7	9.5	8/8	500
CT207	Feature 300	81.0	136.2	3.7	3.1	4.8	7/8	100

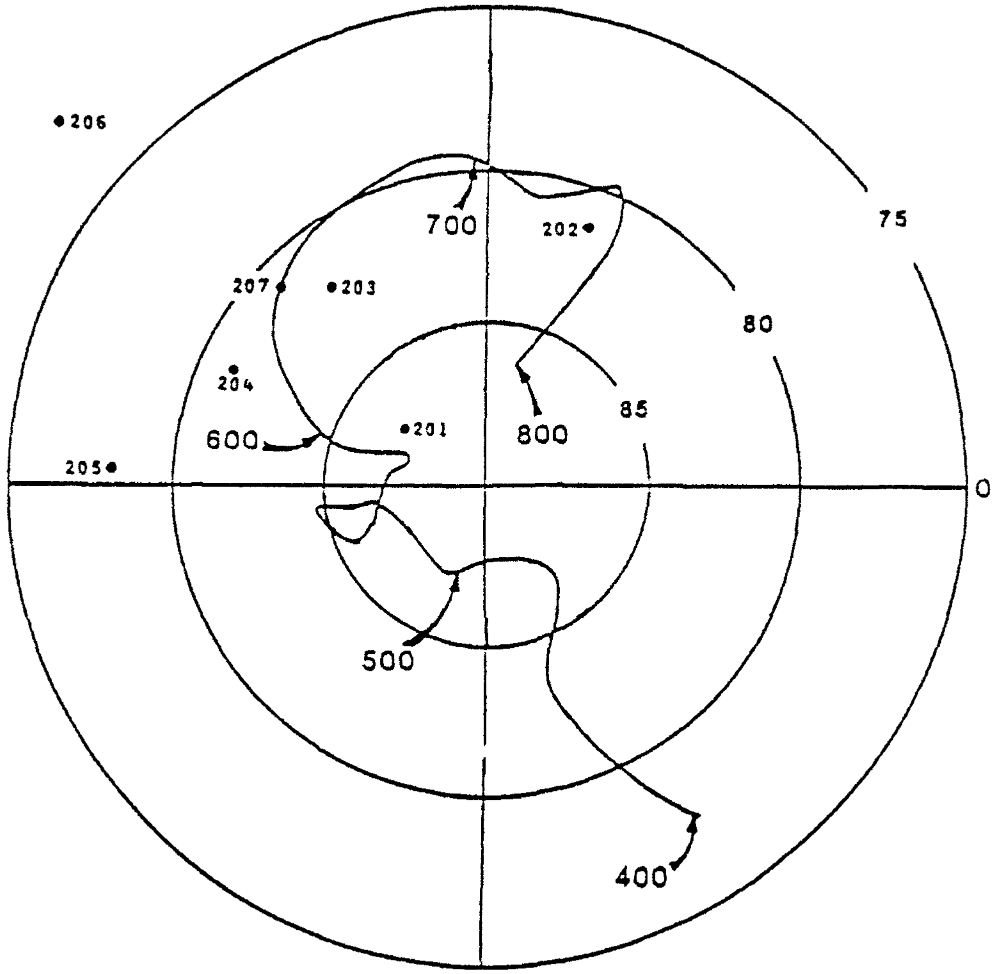

FIGURE VII-1. MESOAMERICAN POLAR CURVE A.D. 400 - 500 AND 3CT50 VIRTUAL GEOMAGNETIC POLES.

the average direction is quite accurate but has an alpha-95 value greater than 4°. Conversely, it is also possible for a baked feature to move as a unit. In this case, the precision might be very good but the average result inaccurate. While these two possibilities are not normal, they should be kept in mind when evaluating archeomagnetic results.

It is interesting to note that sample numbers CT204 and CT203 which were collected from two overlapping baked features (294 and 295), and therefore possibly contemporaneous, have similar VGP positions. The pole positions obtained from the only other pair of overlapping features (316 and 317) are the two that are far from the A.D. 400 - 800 Mesoamerican curve. This suggests the possibility that these features were more severely disturbed than the others from which samples were collected.

It should be emphasized that given their poor precision, the apparent pattern of the 3CT50 VGPs is somewhat surprising. Consequently, at least until more data in the A.D. 400 - 700 time period from Arkansas are obtained, the relative and absolute dates suggested by comparing them to the Mesoamerican polar curve must be regarded as very tentative. It should be noted that even if the configurations of the Mesoamerican and Arkansas curves between ca. A.D. 400 and 700 should prove to be quite similar their calibrations may differ somewhat. In the meantime it will be interesting to see if the analyses of the cultural material and radiocarbon samples recovered at 3CT50 support the relative and absolute dating suggested by the archeomagnetic results.

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APPENDIX VIII

CORRELATION OF 3CT50 ARBITRARY EXCAVATION LEVELS WITH NATURAL STRATIGRAPHY

Table VIII-1 has been prepared to facilitate any subsequent interpretation of project notes and data. The correlation of the arbitrary excavation levels with the natural stratigraphy involved a careful review of all excavation level forms, profile drawings and geomorphological interpretations. In instances where an arbitrary level cut across more than one natural strata, it is so noted on the table. Occasional comments which clarify disturbances within levels are also noted.

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY.

Site Stratigraphic Summary

Stratum Ip = plow zone
I = post prehistoric occupation Big Creek alluvium
II = buried A horizon and prehistoric midden
III = pre-occupation Big Creek alluvium
IV = buried A horizon - theoretically non-cultural
V = Mississippi River post abandonment oxbow lake deposits
VI = Mississippi River active meander deposits
VII = Mississippi River menader levee deposits

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
1	175	290	1	Ip	
			2	VII	
			3	VII	
2	140	300	1	Ip	
			2	Ip	
			3	I	
			4	I	
			5	I	
			6	I/II	
			7	II	
			8	II	
			9	II	
			10	II	
			11	III	
			12	III	
3	149	273	1	Ip	
			2A	Ip	
			2B	I	
			3	I	
			4A	I	
			4B	II	
			5	II	
			6	II	
4	148	329	1	Ip	
			2	Ip/I	
			3	I	
			4	II	
			5	II	
			6	II/III	
			7	III	

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY. (Continuation)

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
5	145	304	1	Ip	
			2A	Ip	
			2B	VII	
			3	VII	
6	149	240	1	Ip	
			2	Ip	
			3	Ip/II	
			4	II	
			5	II	
			6	II	
			7	II/III	
			8	II/III	
			9	III	
7	138	255	1	Ip	
			2	Ip/I	
			3	Ip/I	
			4	I	
			5	I	
			6	I/II	
			7	I/II	
			8	I/II	
8	148	289	1	Ip	Midden Block 4
			2	Ip/I/II	
			3	I/II	
			4	II	
			5	II/III	
			6A	II	
			6B	III	
			7	III	
9	138	289	1	Ip	
			2	Ip/I	
			3	I	
			4	I	
			5	I	
			6	I/II	
			7	II	
			8	II	
			9	II	
			10	II/III	
			11	II	Feature 13
				III	Matrix
			12	II	Feature 13
				III	Matrix

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY. (Continuation)

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
10	128	289	1	Ip	
			2	Ip/I	
			3	I	
			4	I/II	
			5	I/II	
			6	I/II	
			7	I/II	
			8	I/II	
			9	II/III	
			10A	II	
			10B	III	
11	128	309	1	Ip	
			2	Ip/I	
			3	I	
			4	I	
			5	I/II	
			6	II	
			7	II/III	
			8	II	Features 9 & 10
				III	Matrix
12	148	369	1	Ip	
			2	Ip/VII	
			3	VII	
			4	VII	
13	119	315	1	Ip	
			2	Ip/I	
			3	I	
			4	I/II	
			5	II	Feature 8 (also Level 5A)
				III	Matrix (Level 5B)
			6A	II	Feature 8
			6B	III	
			7	II	Feature 8
				III	Matrix
14	182	335	1	Ip	
			2	Ip/I	
			3	I	
			4	I	
			5	I/III	
			6	III	
			7	III	
			8	III	

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY. (Continuation)

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
15	182	335	1	Ip	
			2	Ip	
			3	Ip/I	
			4	I	Also some siesmic disturbance in the form of
			5	I	sandfilled cracks
			6	I/II	
			7	II/III	
			8	II/III	
			9	II/III	
			10	III	
16	150	289	1	Ip	Midden Block 4
			2	Ip/I/II	
			3	I/II	
			4	II	
			5	II/III	
17	155	308	1	Ip	
			2	Ip/I	
			3	I/II	
			4	II/III	Only midden pockets
			5	II/III	Only midden pockets
			6	II/III	
18	156	273	1	Ip/II	Midden Block 3
			2	Ip/II/III	
			3	II/III	
			4	II/III	S1/2 only
19	154	273	1	Ip	Midden Block 3
			2A	Ip	
			2B	II	
			3	II/III	
			4	II	
			5	II/III	
			6	III	N1/2 only
				II	S1/2 only
20	152	273	1	Ip	Midden Block 3
			2	Ip/II	
			3	Ip/II	
			4	II	N1/2 only
				III	S1/2 only
			5	II/III	
			6	II	

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY. (Continuation)

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
20 (Continued)	152	273	7	II/III	
			8	II/III	
			9	II	S1/2 only
21	156	269	1	Ip	Midden Block 3
			2	Ip/II	
			3	Ip/II	
			4	II	S1/2 only
				III	N1/2 only
			5	III	
22	154	269	1	Ip	Midden Block 3
			2	Ip	
			3	Ip/II	
			4	II	
			5	II	S1/2 only
				III	N1/2 only
			6	II/III	S1/2 only
23	152	269	1	Ip	Midden Block 3
			2	Ip/II	
			3	Ip/II	
			4	II	N1/2 only
			5	II/III	
			6	II/III	
			7	II/III	N1/2 only
				II	S1/2 only
			8	II/III	
24	156	265	1	Ip/I	Midden Block 3
			2	I/II/III	
			3	II	S1/2 only
				III	N1/2
			4	III	
25	154	265	1	Ip	Midden Block 3
			2	Ip/II	
			3	Ip/II	
			4	II	N1/2 only
			5	II/III	
			6	II/III	
26	152	265	1	Ip	Midden Block 3
			2	Ip/II	
			3	Ip/II	

TABLE VIII-1. CORRELATION OF ARBITRARY LEVELS WITH NATURAL STRATIGRAPHY. (Continuation)

TEST UNIT	PROVENIENCE North	PROVENIENCE East	ARBITRARY LEVEL	NATURAL STRATUM	COMMENTS
26	152	265	4	II	
(Continued)			5	II	
			6	II	
			7	II/III	
			8	II/III	
			9	II/III	
27	152	289	X	Ip	Midden Block 4: 0-27 cm
			Y	Ip	27-37 cm
			Z	Ip/II	37-57 cm
			1	II	57-67 cm
			2	II	67-77 cm
			3	II	77-87 cm
			4	II	87-97 cm
			5	II/III	97-107 cm
28	154	289	X	Ip	Midden Block 4: 0-27 cm
			Y	Ip	27-37 cm
			Z	Ip/I	37-57 cm
			1	II/III	57-67 cm
			2	II/III	S1/2; 67-77 cm
			3	II/III	77-87 cm
			4	III	87-97 cm

APPENDIX IX

FEATURE DATA

Table IX-1 presents a summary of all feature data. As noted in Chapter Four of the main text, between the Phase I delineation of features and the Phase II completion of feature excavation and evaluation several features were determined to be natural occurrences. All features were assigned field numbers sequentially; therefore, feature designations for features that were field voided do not appear on the table.

Additionally, the category 12 and 13 features represent cultural deposits which were determined during the field, and data synthesis portions of the project to be midden remnants and not features *per se.* For the sake of continuity, however, these feature numbers were retained, though the artifactual materials recovered from these deposits were evaluated in the same manner as test pit and backhoe information. No dimension data is presented for category 12 and 13 features, as they actually represent sections of larger cultural deposits.

A short word about the table is also warranted. Cultural affiliation is based solely on the types of ceramics recovered from the feature, and, where possible, the features' association within a structure or feature cluster which has been temporally assigned.

TABLE IX-1. SUMMARIZED FEATURE DATA.
(Page 1 of 19)

FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
4	175.38	304.80	1	9 x 8 cm	circular	10 cm	straight	
5	175.48	304.11	1	23 x 16 cm	oval	18 cm	tapered	
7	138.50	254.50	12	N/A	N/A	N/A	N/A	
8	119.30	314.50	12	N/A	N/A	N/A	N/A	
9	129.00	309.15	12	N/A	N/A	N/A	N/A	
10	128.30	309.80	12	N/A	N/A	N/A	N/A	
11	149.50	289.10	12	N/A	N/A	N/A	N/A	
12	148.10	289.15	12	N/A	N/A	N/A	N/A	
13	139.70	288.40	12	N/A	N/A	N/A	N/A	
14	89.90	336.80	12	N/A	N/A	N/A	N/A	
20	184.95	305.90	1	12 x 11 cm	circular	70 cm	tapered	no ceramics
21	184.15	306.90	1	16 x 15 cm	circular	10 cm	U-shaped	1 Baytown Plain
22	184.08	306.81	1	11 x 11 cm	circular	14 cm	tapered	
27	182.70	306.25	2	50 x 35 cm	rectangular	15 cm	straight	Baytown
28	181.05	308.15	2	47 x 42 cm	rectangular	18 cm	straight	A.D. 646
29A	181.50	306.87	3	45 x 40 cm	oval	20 cm	tapered	
29B	181.50	306.87	4	60 x 55 cm	irregular	-	basin-shaped	
30	183.70	307.50	9	300 x 90 cm	elongated	28 cm	basin-shaped	no ceramics
31	183.10	308.20	1	36 x 30 cm	circular	11 cm	V-shaped	no ceramics
36	175.35	303.40	1	18 x 18 cm	circular	15 cm	straight	
45	171.60	304.00	1	19 x 19 cm	circular	20 cm	V-shaped	1 Grit temper
50	176.75	303.00	3	55 x 55 cm	circular	24 cm	basin-shaped	1 Baytown

TABLE IX-1. SUMMARIZED FEATURE DATA.
(Page 2 of 19)

FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
56	179.90	308.40	2	46 x 36 cm	rectangular	11 cm	straight	3 Baytown Plain
58	178.45	300.18	13					Baytown
59	177.10	309.75	3	30 x 28 cm	circular	9 cm	basin-shaped	2 Baytown Plain
60	177.44	307.10	1	28 x 24 cm	circular	17 cm	V-shaped	
61	177.70	305.00	2	60 x 50 cm	rectangular	17 cm	straight	Baytown
62	176.82	305.38	1	15 x 15 cm	circular	13 cm	V-shaped	
63	175.76	305.00	1	20 x 20 cm	circular	30 cm	straight	1 Baytown Plain
65	175.45	308.68	13	20 x 19 cm	circular	20 cm	U-shaped	no ceramics
66	175.85	306.70	1	18 x 18 cm	oval	28 cm	straight	1 Baytown Plain
67	175.75	306.15	13	25 x 23 cm	irregular	13 cm	irregular	
68	176.10	306.30	1	21 x 20 cm	circular	22 cm	straight	
69	175.98	307.18	13	8 x 8 cm	circular	7 cm	tapered	1 Baytown Plain
72	176.22	307.75	13	18 x 18 cm	circular	12 cm	U-shaped	
78	172.40	299.60	4	50 x 50 cm	circular	13 cm	basin-shaped	1 Baytown Plain
80	171.90	299.86	13	23 x 20 cm	circular	15 cm	irregular	
81	171.60	299.97	1	15 x 14 cm	circular	38 cm	straight	1 Baytown Plain
82	171.60	299.00	4	64 x 64 cm	circular	10 cm	basin-shaped	no ceramics
85	170.85	300.00	4	54 x 47 cm	circular	11 cm	basin-shaped	
86	172.25	299.90	3	47 x 43 cm	oval	16 cm	straight	Baytown
87	171.50	299.30	11	44 x 30 cm	irregular	5 cm	basin-shaped	
90	172.50	301.20	3	65 x 56 cm	circular	18 cm	basin-shaped	Baytown
91	170.00	300.80	10	40 x 39 cm	circular	5 cm	basin-shaped	

TABLE IX-1. SUMMARIZED FEATURE DATA.
(Page 3 of 19)

FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
92	170.00	300.30	10	62 x 59 cm	circular	7 cm	irregular	3 Baytown Plain
93	171.20	304.30	3	30 x 30 cm	circular	6 cm	basin-shaped	Baytown
94	172.40	303.30	3	53 x 45 cm	circular	27 cm	straight	1 Baytown Plain
95	172.10	302.80	1	24 x 23 cm	circular	21 cm	V-shaped	
99	173.10	300.35	13	23 x 20 cm	irregular	20 cm	irregular	1 Baytown Plain
101	171.95	300.55	1	18 x 18 cm	circular	24 cm	irregular	Baytown
102	174.55	300.50	6	110 x 110 cm	oval	70 cm	bell-shaped	Baytown
103	172.70	301.65	1	22 x 14 cm	oval	13 cm	V-shaped	
105	173.90	302.20	1	28 x 28 cm	circular	12 cm	irregular	
107	172.50	301.60	1	21 x 18 cm	circular	30 cm	straight	1 Baytown Plain
108	172.20	302.10	1	20 x 18 cm	oval	9 cm	V-shaped	
112	172.05	301.40	1	22 x 19 cm	circular	46 cm	V-shaped	1 Baytown Plain
113	170.25	302.05	1	23 x 20 cm	oval	11 cm	straight	
114	170.40	302.35	1	20 x 20 cm	circular	15 cm	straight	1 Baytown Plain
123	174.60	304.00	1	24 x 22 cm	circular	18 cm	irregular	
124	173.90	304.90	13	20 x 20 cm	circular	17 cm	V-shaped	
125	173.40	304.15	13	37 x 33 cm	oval	14 cm	irregular	
126	173.25	304.65	13	25 x 23 cm	circular	13 cm	tapered	
127	173.10	304.80	13	27 x 24 cm	circular	21 cm	irregular	
132	171.20	304.85	1	25 x 20 cm	oval	20 cm	amorphous	
133	171.70	303.60	1	15 x 14 cm	circular	19 cm	tapered	1 Grit temper
134	171.35	305.45	13	25 x 20 cm	oval	23 cm	V-shaped	2 Grit temper

TABLE IX-1. SUMMARIZED FEATURE DATA.
(Page 4 of 19)

FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
138	170.55	303.75	1	20 x 17 cm	circular	20 cm	straight	
139	170.28	300.60	13	24 x 20 cm	circular	18 cm	V-shaped	2 Baytown Plain
140	171.68	305.97	13	30 x 20 cm	oval	30 cm	U-shaped	
141	172.70	305.05	1	21 x 20 cm	circular	22 cm	slanted	
142	172.55	304.75	1	20 x 20 cm	circular	14 cm	V-shaped	1 Baytown Plain
143	172.85	305.20	13	17 x 16 cm	circular	12 cm	U-shaped	
144	170.30	305.12	1	17 x 17 cm	circular	16 cm	amorphous	
145	173.35	305.48	13	20 x 18 cm	circular	23 cm	V-shaped	
146	173.70	305.32	13	25 x 23 cm	circular	19 cm	tapered	
148	172.85	305.95	1	12 x 11 cm	circular	5 cm	tapered	
149	172.95	305.25	13	11 x 10 cm	circular	5 cm	tapered	
150	171.20	305.70	13	22 x 22 cm	circular	14 cm	U-shaped	
151	171.50	306.30	13	18 x 18 cm	circular	8 cm	basin-shaped	
153	171.70	307.00	13	12 x 12 cm	circular	15 cm	V-shaped	
154	171.25	307.40	13	47 x 30 cm	irregular	18 cm	basin-shaped	
156	170.58	305.95	13	22 x 20 cm	circular	18 cm	irregular	
159	170.85	306.65	13	16 x 13 cm	oval	8 cm	basin-shaped	
161	174.23	305.24	1	18 x 17 cm	circular	16 cm	tapered	
162	174.31	305.70	13	24 x 23 cm	circular	23 cm	slanted	
163	174.80	305.60	13	20 x 18 cm	circular	27 cm	tapered	
164	174.61	305.88	13	15 x 15 cm	circular	10 cm	U-shaped	
165	174.25	306.22	13	21 x 18 cm	circular	11 cm	basin-shaped	

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
167	173.52	306.12	1	20 x 20 cm	circular	13 cm	tapered	
168	173.70	306.32	1	16 x 16 cm	circular	20 cm	U-shaped	3 Baytown Plain
169	174.00	306.65	1	20 x 20 cm	circular	19 cm	tapered	
170	174.55	305.70	13	21 x 21 cm	circular	15 cm	irregular	
172	175.10	308.38	13	20 x 19 cm	circular	20 cm	U-shaped	
173	173.40	308.40	2	45 x 45 cm	square	7 cm	straight	
174	174.15	309.55	2	46 x 40 cm	square	9 cm	tapered	
176	171.08	308.15	13	17 x 16 cm	circular	26 cm	irregular	
177	171.19	308.28	13	29 x 29 cm	circular	40 cm	straight	
178	174.85	303.15	1	26 x 16 cm	oval	11 cm	U-shaped	1 Baytown Plain
179	171.80	305.79	1	17 x 17 cm	circular	14 cm	tapered	
186	172.70	308.35	13	13 x 13 cm	circular	10 cm	U-shaped	
189A	170.45	308.40	1	36 x 36 cm	circular	8 cm	basin-shaped	
189B	174.95	310.54	2	36 x 36 cm	square	8 cm	tapered	
190	171.72	308.40	1	13 x 13 cm	circular	16 cm	V-shaped	
195	166.70	298.70	3	60 x 50 cm	circular	24 cm	tapered	
196	165.60	297.84	1	18 x 18 cm	circular	24 cm	straight	Indet. Miss.
198	167.22	297.85	13	20 x 20 cm	circular	15 cm	irregular	Indet. Miss.
199	167.25	297.45	4	76 x 65 cm	oval	10 cm	basin-shaped	
204	169.50	298.30	1	20 x 20 cm	circular	20 cm	straight	1 Baytown Plain
206	169.70	299.28	13	21 x 19 cm	circular	6 cm	basin-shaped	1 Sand temper
207	169.90	299.80	1	20 x 19 cm	circular	9 cm	straight	1 Baytown Plain

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
208	167.60	298.85	4	60 x 56 cm	circular	18 cm	basin-shaped	1 Baytown Plain
209	169.70	299.25	13	14 x 12 cm	oval	11 cm	tapered	
210	167.98	298.20	13	16 x 15 cm	circular	15 cm	straight	
212	169.15	300.65	4	30 x 66 cm	circular	16 cm	basin-shaped	Baytown
215	169.40	300.25	1	19 x 19 cm	circular	11 cm	straight	Baytown
216	167.77	300.85	1	24 x 21 cm	oval	16 cm	straight	
218A	166.35	300.25	5	55 x 49 cm	circular	41 cm	tapered	
218B	166.35	300.25	1	16 x 14 cm	circular	18 cm	tapered	
223	167.35	303.40	1	25 x 18 cm	oval	16 cm	straight	
224	165.80	303.45	13	n/a	n/a	n/a	n/a	Baytown
226	165.30	304.35	13	28 x 14 cm	oval	41 cm	V-shaped	
227	165.60	304.30	1	23 x 20 cm	circular	17 cm	V-shaped	
228	166.40	304.20	3	44 x 39 cm	oval	16 cm	basin-shaped	Baytown
229	167.25	304.60	1	30 x 24 cm	oval	35 cm	straight	
230	168.30	304.60	1	23 x 22 cm	circular	17 cm	tapered	
231	169.60	304.60	13	20 x 15 cm	oval	12 cm	tapered	
233	169.75	304.25	13	27 x 21 cm	oval	12 cm	U-shaped	
254	165.50	301.65	4	130 x 97 cm	oval	28 cm	basin-shaped	3 Baytown Plain
255	164.60	303.79	1	17 x 17 cm	circular	17 cm	V-shaped	
256	165.50	275.95	4	130 x 120 cm	oval	9 cm	basin-shaped	6 Sand/Grit
257	168.30	276.65	7	126 x 109 cm	circular	45 cm	irregular	
258	165.10	279.20	4	98 x 90 cm	oval	15 cm	basin-shaped	

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
259	170.00	279.60	4	46 x 45 cm	circular	11 cm	basin-shaped	
262	171.11	280.45	1	27 x 22 cm	oval	21 cm	tapered	
267A	171.83	284.31	4	50 x 37 cm	oval	17 cm	basin-shaped	Indet. Miss.
267B	171.83	284.31	1	21 x 17 cm	oval	9 cm	U-shaped	
269	174.51	284.06	1	21 x 20 cm	circular	20 cm	straight	Baytown
272	172.98	286.80	1	15 x 13 cm	circular	22 cm	straight	
274A	171.50	286.65	4	79 x 36 cm	oval	26 cm	basin-shaped	
274B	171.50	286.65	1	35 x 19 cm	oval	16 cm	V-shaped	
276	171.34	288.04	1	31 x 24 cm	circular	13 cm	V-shaped	
277	171.60	288.10	1	29 x 24 cm	circular	33 cm	V-shaped	
280	172.39	288.97	1	19 x 16 cm	oval	11 cm	V-shaped	1 Baytown Plain
281	172.54	289.12	1	15 x 14 cm	circular	10 cm	V-shaped	Baytown
282	173.30	289.40	1	32 x 28 cm	circular	28 cm	irregular	
283	173.98	289.54	1	16 x 15 cm	circular	7 cm	basin-shaped	
284	174.62	289.89	4	73 x 60 cm	oval	29 cm	basin-shaped	Baytown & Grit
285	174.65	289.30	1	19 x 18 cm	circular	22 cm	straight	
286	172.73	286.90	4	55 x 36 cm	oval	22 cm	basin-shaped	1 Baytown Plain
287	172.73	287.75	4	85 x 45 cm	oval	18 cm	basin-shaped	
289	173.40	286.50	4	54 x 31 cm	oval	19 cm	basin-shaped	
290	175.00	286.00	4	50 x 45 cm	circular	21 cm	tapered	Baytown
291	175.70	286.28	1	25 x 22 cm	circular	13 cm	basin-shaped	
294	178.55	287.50	3	45 x 36 cm	oval	14 cm	straight	Baytown

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
295	178.10	287.55	3	55 x 31 cm	oval	31 cm	basin-shaped	Baytown
299	172.85	285.10	3	79 x 66 cm	circular	21 cm	basin-shaped	Baytown
300	176.50	286.70	3	75 x 62 cm	circular	21 cm	basin-shaped	Baytown & Grit
302	177.90	288.65	4	74 x 53 cm	oval	20 cm	basin-shaped	Baytown, Indet. Miss. & Grit
303	176.45	289.22	1	9 x 9 cm	circular	24 cm	straight	
305A	178.90	309.30	4	100 x 75 cm	amorphous	14 cm	basin-shaped	
305B	179.25	309.20	2	40 x 30 cm	square	14 cm	straight	
306	179.70	288.60	3	74 x 73 cm	circular	33 cm	irregular	Baytown & Grit
313	175.35	287.12	1	29 x 27 cm	circular	20 cm	straight	Baytown
314	175.78	287.60	1	12 x 10 cm	circular	25 cm	V-shaped	Baytown
316	178.67	288.50	3	40 x 30 cm	oval	20 cm	tapered	Baytown
317	178.98	288.50	3	34 x 32 cm	circular	38 cm	straight	Baytown & Grit
318	175.70	288.30	2	58 x 49 cm	rectangular	8 cm	straight	1 Baytown Plain
322	176.00	291.84	1	13 x 13 cm	circular	9 cm	U-shaped	1 Baytown Plain
323	179.55	294.45	2	36 x 35 cm	square	10 cm	tapered	Baytown
324	177.35	294.20	4	61 x 50 cm	rectangular	16 cm	tapered	Baytown
325	178.30	294.00	2	56 x 51 cm	square	14 cm	basin-shaped	Baytown
326	179.80	291.90	13	26 x 25 cm	circular	10 cm	basin-shaped	1 Baytown Plain
327	177.83	292.12	2	60 x 48 cm	square	25 cm	irregular	Baytown
330	172.80	290.90	4	85 x 57 cm	oval	20 cm	basin-shaped	Baytown
331	179.05	290.92	3	54 x 53 cm	circular	36 cm	basin-shaped	Baytown
332	177.00	290.40	3	53 x 45 cm	circular	18 cm	tapered	Baytown

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
334	177.55	290.40	1	24 x 21 cm	circular	10 cm	basin-shaped	Baytown
335	178.33	291.38	13	11 x 11 cm	circular	14 cm	tapered	1 Baytown Plain
336	178.55	291.35	13	15 x 15 cm	circular	23 cm	V-shaped	
338	178.95	290.50	13	6 x 6 cm	circular	5 cm	V-shaped	
341	179.40	291.80	13	7 x 6 cm	circular	8 cm	V-shaped	
342	177.68	294.65	1	16 x 15 cm	circular	56 cm	straight	Baytown
343	179.70	292.75	3	71 x 70 cm	circular	14 cm	tapered	Baytown
344	180.50	289.70	1	20 x 20 cm	circular	23 cm	V-shaped	1 Baytown Plain
345	184.85	292.50	1	14 x 12 cm	circular	19 cm	V-shaped	Baytown
348	183.45	293.85	1	15 x 15 cm	circular	16 cm		
351	182.63	294.52	9	265 x 62 cm	elongated	29 cm	basin-shaped	Indet. Miss.
352	182.11	294.00	13	15 x 14 cm	circular			Indet. Miss.
354	180.15	290.20	1	15 x 14 cm	circular	12 cm	V-shaped	1 Baytown Plain
355	180.35	291.50	13	12 x 12 cm	circular	15 cm	V-shaped	
357	178.20	292.20	1	17 x 17 cm	circular	32 cm	straight	
358	184.70	295.30	12					Baytown
359	180.40	294.45	1	22 x 20 cm	circular	26 cm	V-shaped	Baytown
363	181.60	292.73	3	39 x 37 cm	circular	13 cm	basin-shaped	Baytown
365	181.75	291.85	1	20 x 19 cm	circular	45 cm	straight	Indet. Miss.
366	182.20	291.05	1	27 x 27 cm	circular	30 cm	V-shaped	2 Baytown Plain
367	182.30	290.50	1	30 x 27 cm	oval	20 cm	V-shaped	Baytown
368	182.42	290.15	1	22 x 22 cm	circular	22 cm	tapered	1 Baytown Plain

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
369	182.60	291.00	13	10 x 10 cm	circular	13 cm	taperedd	
370	182.75	291.00	13	13 x 13 cm	circular	11 cm	U-shaped	
374	183.45	292.20	1	15 x 15 cm	circular	10 cm	tapered	
375	183.55	291.40	1	20 x 20 cm	circular	20 cm	U-shaped	1 Baytown Plain
376	183.50	290.55	2	38 x 30 cm	rectangular	33 cm	straight	Baytown & Grit
379	182.60	294.75	1	13 x 12 cm	circular	16 cm	tapered	
380	183.25	291.30	3	65 x 62 cm	circular	22 cm	basin-shaped	Baytown
381	183.55	293.00	1	19 x 16 cm	oval	24 cm	tapered	1 Baytown Plain
382	184.10	286.10	1	19 x 19 cm	circular	10 cm	basin-shaped	
389	185.00	296.20	10	70 x 58 cm	irregular	13 cm	basin-shaped	2 Baytown Plain
403	189.30	291.20	5	63 x 57 cm	circular	27 cm	tapered	Baytown & Grit
404	188.70	292.00	1	19 x 18 cm	circular	20 cm	U-shaped	
405	188.80	292.40	1	20 x 20 cm	circular	18 cm	straight	1 Baytown Plain
406	188.04	290.84	1	18 x 18 cm	circular	34 cm	tapered	1 Baytown Plain
407	187.60	290.85	1	18 x 18 cm	circular	25 cm	straight	3 Baytown Plain
408	187.83	291.25	4	55 x 54 cm	circular	12 cm	basin-shaped	4 Baytown Plain
409	186.90	291.30	1	18 x 17 cm	circular	28 cm	U-shaped	Baytown
410	186.90	291.83	4	60 x 55 cm	circular	6 cm	basin-shaped	3 Baytown Plain
411	187.38	292.40	4	65 x 61 cm	circular	8 cm	basin-shaped	3 Baytown Plain
412	187.90	292.80	4	68 x 67 cm	circular	20 cm	basin-shaped	Baytown
413	188.40	293.64	4	91 x 83 cm	circular	30 cm	tapered	Baytown
414	187.63	293.27	12	73 x 69 cm	circular	9 cm	basin-shaped	Indet. Miss.

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
415	186.16	292.33	1	13 x 13 cm	circular	5 cm	basin-shaped	
417	185.45	291.43	3	47 x 42 cm	circular	51 cm	U-shaped	Baytown
418	185.10	291.50	1	31 x 25 cm	oval	57 cm	V-shaped	
419A	185.42	291.80	3	65 x 63 cm	circular	20 cm	U-shaped	Baytown
419B	185.42	291.80	2	65 x 63 cm	circular	20 cm	straight	
420	189.00	294.25	1	17 x 16 cm	circular	19 cm	straight	1 Baytown Plain
426	187.40	294.10	1	21 x 19 cm	circular	20 cm	straight	1 Baytown Plain
427	187.20	294.05	1	15 x 13 cm	circular	12 cm	straight	
428	188.35	294.10	4	54 x 53 cm	amorphous	11 cm	basin-shaped	Baytown
430	186.90	293.60	10	130 x 60 cm	oval	7 cm	basin-shaped	Baytown/Miss.
433	184.95	290.18	2	52 x 39 cm	rectangular	19 cm	straight	Indet. Miss.
435	187.30	290.30	4	44 x 43 cm	circular	11 cm	basin-shaped	1 Baytown Plain
605	170.87	300.55	13	25 x 25 cm	circular	32 cm	tapered	
609	170.80	304.10	13	20 x 18 cm	circular	14 cm	U-shaped	
610	177.75	294.40	1	17 x 17 cm	circular	33 cm	U-shaped	Baytown/Sand
611	179.87	292.35	13	16 x 16 cm	circular	32 cm	tapered	
612	177.00	290.57	1	12 x 10 cm	circular	12 cm	tapered	
613	177.05	290.55	4	80 x 76 cm	circular	1[illegible] cm	basin-shaped	
616	173.70	300.90	10	52 x 48 cm	circular	6 cm	irregular	Baytown
617	177.73	293.50	1	15 x 15 cm	circular	49 cm	U-shaped	Baytown
625	170.00	285.80	4	142 x 88 cm	elongated	22 cm	basin-shaped	
635	175.25	290.90	4	95 x 45 cm	oval	20 cm	basin-shaped	4 Baytown Plain

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
636	178.25	290.90	1	45 x 44 cm	circular	9 cm	basin-shaped	
637	180.85	288.10	13	15 x 15 cm	circular	53 cm	straight	
638	183.12	290.78	1	12 x 12 cm	circular	26 cm	U-shaped	
639	183.12	290.65	13	24 x 24 cm	circular	16 cm	tapered	
640	178.10	291.10	1	31 x 30 cm	circular	52 cm	U-shaped	Baytown & Grit
641	179.35	290.73	1	22 x 21 cm	circular	32 cm	straight	2 Baytown Plain
642	172.40	303.30	1	13 x 12 cm	circular	14 cm	tapered	
650	171.33	284.60	4	100 x 60 cm	oval	15 cm	basin-shaped	1 Baytown Plain
652	170.91	283.61	1	23 x 18 cm	oval	24 cm	tapered	
654	170.80	282.50	8	163 x 60 cm	elongated	22 cm	basin-shaped	Indet. Miss.
655	181.50	292.60	1	17 x 16 cm	circular	13 cm	U-shaped	
656	179.40	303.80	3	77 x 70 cm	circular	39 cm	basin-shaped	Baytown
657	178.40	304.30	3	59 x 54 cm	circular	17 cm	basin-shaped	Baytown
658	178.50	303.50	8	127 x 56 cm	oval	20 cm	basin-shaped	Baytown & Grit
659	177.60	303.40	3	83 x 66 cm	circular	38 cm	basin-shaped	Baytown
660	181.50	293.35	5/1	40 x 38 cm	circular	36 cm	irregular	Baytown
661	172.64	282.30	1	15 x 12 cm	oval	10 cm	basin-shaped	
662	175.60	293.28	1	20 x 18 cm	circular	7 cm	basin-shaped	1 Baytown Plain
664	167.90	278.00	10	219 x 153 cm	oval	12 cm	basin-shaped	Baytown
665	176.23	287.22	1	29 x 27 cm	circular	20 cm	U-shaped	1 Baytown Plain
666	175.12	289.79	1	14 x 14 cm	circular	14 cm	tapered	
667	175.60	289.05	1	14 x 11 cm	irregular	20 cm	straight	2 Baytown Plain

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
668	171.35	284.79	1	21 x 20 cm	circular	26 cm	tapered	
669	178.15	288.95	1	23 x 18 cm	oval	20 cm	U-shaped	
670	177.90	288.65	1	25 x 21 cm	oval	20 cm	straight	
671	172.35	299.82	1	20 x 17 cm	circular	22 cm	straight	1 Baytown Plain
672	170.55	281.80	1	17 x 13 cm	oval	53 cm	slanted	
673	170.50	282.75	1	18 x 18 cm	circular	52 cm	slanted	
674	171.05	282.80	1	16 x 14 cm	circular	65 cm	slanted	
675	171.20	281.90	1	16 x 22 cm	oval	65 cm	slanted	
676	173.25	300.85	1	14 x 13 cm	circular	17 cm	straight	
677	170.60	300.63	13	20 x 20 cm	circular	11 cm	tapered	
678	171.80	305.45	13	15 x 15 cm	circular	26 cm	straight	
679	171.65	305.60	13	33 x 25 cm	oval	16 cm	basin-shaped	
680	185.30	293.90	1	15 x 15 cm	circular	20 cm	straight	Baytown
681	185.57	294.18	1	16 x 13 cm	circular	18 cm	straight	2 Baytown Plain
682	190.13	291.50	4	19 x 17 cm	circular	15 cm	straight	4 Baytown Plain
683	189.10	291.55	1	22 x 21 cm	circular	15 cm	straight	
684A	181.90	305.30	3	68 x 64 cm	oval	15 cm	basin-shaped	Baytown
684B	187.90	292.95	1	17 x 14 cm	circular	40 cm	straight	1 Baytown Plain
685	180.20	305.90	4	70 x 70 cm	amorphous	25 cm	basin-shaped	Baytown, Grit, and Sand
686	186.80	293.32	1	16 x 13 cm	oval	12 cm	tapered	
687	189.35	290.20	1	19 x 15 cm	oval	14 cm	U-shaped	1 Baytown Plain
688	189.60	291.33	1	18 x 14 cm	oval	22 cm	U-shaped	2 Baytown Plain

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
689	181.25	305.80	4	68 x 60 cm	circular	20 cm	basin-shaped	Baytown
690	182.80	305.20	2	50 x 49 cm	rectangular	10 cm	tapered	Baytown
691	182.05	304.75	9	N/A x 118 cm	circular	30 cm	basin-shaped	24 Grit temper
692	179.60	309.65	10	105 x 75 cm	irregular	5 cm	basin-shaped	
693	186.35	289.40	1	18 x 17 cm	circular	28 cm	straight	1 Baytown Plain
694	180.20	306.50	3	63 x 60 cm	oval	21 cm	straight	Baytown
697	180.18	296.58	13	13 x 12 cm	circular	5 cm	basin-shaped	
698	181.12	296.58	1	14 x 12 cm	circular	24 cm	straight	2 Baytown Plain
699	179.95	296.78	1	25 x 19 cm	oval	7 cm	basin-shaped	
700	181.20	297.67	1	24 x 18 cm	oval	11 cm	tapered	
702	180.05	298.25	1	20 x 19 cm	circular	13 cm	tapered	
703	182.04	297.85	13	17 x 16 cm	circular	11 cm	tapered	
705A	181.60	297.00	4	104 x 87 cm	oval	25 cm	basin-shaped	
705B	181.60	297.11	1	29 x 26 cm	circular	53 cm	straight	
708	180.15	295.22	13	9 x 8 cm	circular	9 cm	tapered	
709	180.14	295.40	1	24 x 21 cm	circular	26 cm	irregular	
714	183.05	296.85	1	24 x 21 cm	circular	10 cm	basin-shaped	
715	180.14	295.40	13	9 x 8 cm	circular	10 cm	tapered	
719	184.58	296.55	1	33 x 33 cm	circular	37 cm	tapered	Baytown
725	182.05	296.35	1	24 x 23 cm	circular	19 cm	tapered	Baytown?
728	185.00	305.60	2	40 x 32 cm	rectangular	20 cm	irregular	Baytown
729	180.00	305.90	3	70 x 60 cm	circular	28 cm	basin-shaped	Baytown & Grit

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
730	182.00	305.00	2	40 x 39 cm	square	16 cm	straight	Baytown
732	174.80	283.78	3	49 x 29 cm	oval	11 cm	basin-shaped	
733	175.20	283.04	1	25 x 14 cm	circular	13 cm	irregular	1 Baytown Plain
736	175.25	285.09	1	24 x 24 cm	circular	13 cm	straight	Baytown
737	179.25	283.60	10	48 x 43 cm	circular	5 cm	basin-shaped	2 Baytown Plain
738	177.50	285.35	4	40 x 38 cm	circular	15 cm	basin-shaped	Baytown
735	179.58	283.85	1	25 x 25 cm	circular	7 cm	straight	Baytown
740	179.35	284.11	1	28 x 22 cm	oval	12 cm	tapered	Baytown
742	175.75	281.70	1	28 x 26 cm	circular	5 cm	basin-shaped	
743	176.75	284.50	1	24 x 23 cm	circular	15 cm	tapered	
744	176.50	284.04	1	19 x 18 cm	circular	43 cm	irregular	3 Baytown Plain
745A	174.60	284.75	1	19 x 19 cm	circular	26 cm	unknown	Baytown
745B	174.50	284.75	1	18 x 17 cm	circular	26 cm	unknown	Baytown
746	176.00	284.00	4	61 x 57 cm	circular	19 cm	basin-shaped	Baytown
747	179.25	285.90	5	57 x 48 cm	oval	28 cm	irregular	Baytown
748	180.35	285.75	3	56 x 44 cm	circular	18 cm	straight	Baytown
749	179.35	284.50	3	53 x 41 cm	oval	16 cm	basin-shaped	Baytown
751	184.00	297.00	1	25 x 15 cm	oval	7 cm	basin-shaped	
752	185.45	298.13	1	12 x 12 cm	circular	16 cm	straight	2 Baytown Plain
753	184.90	299.00	1	27 x 24 cm	circular	17 cm	straight	Baytown, Miss., and Grit
756	185.30	297.70	2	40 x 41 cm	square	13 cm	straight	Baytown
757	186.36	297.34	1	20 x 18 cm	circular	11 cm	straight	

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
758	186.80	297.19	1	26 x 24 cm	circular	12 cm	tapered	1 Baytown Plain
759	186.58	298.38	13	19 x 18 cm	circular	8 cm	basin-shaped	
760	186.20	298.40	13	33 x 33 cm	circular	8 cm	basin-shaped	1 Baytown Plain
762	183.10	298.90	1	16 x 15 cm	circular	36 cm	tapered	Baytown
763	183.67	297.00	1	13 x 12 cm	circular	10 cm	tapered	Baytown
766	185.50	298.50	12	n/a	n/a			Baytown
768	186.35	300.50	4	79 x 59 cm	oval	15 cm	basin-shaped	8 Grit temper
769	186.90	299.20	9	230 x 51 cm	elongated	16 cm	tapered	Baytown, Miss., & Grit
770	187.23	297.52	1	17 x 16 cm	circular	20 cm	U-shaped	
771	186.15	296.30	1	26 x 15 cm	oval	23 cm	tapered	Baytown
772	187.82	297.82	1	10 x 9 cm	circular	14 cm	tapered	
773	186.50	296.90	1	21 x 19 cm	oval	30 cm	tapered	Baytown
774	186.70	296.75	1	32 x 27 cm	circular	37 cm	tapered	Baytown
775	187.75	298.50	1	18 x 18 cm	circular	24 cm	tapered	1 Baytown Plain
776	180.55	305.50	1	38 x 38 cm	circular	15 cm	tapered	
777	181.78	304.72	1	20 x 18 cm	circular	8 cm	basin-shaped	
778	186.00	296.35	1	22 x 19 cm	oval	56 cm	tapered	1 Baytown Plain
779	185.80	296.10	1	24 x 19 cm	oval	26 cm	tapered	Baytown
780	182.55	298.40	3	56 x 55 cm	circular	10 cm	basin-shaped	
781	182.30	298.60	13	35 x 33 cm	oval	10 cm	basin-shaped	
782	182.20	298.60	13	20 x 19 cm	circular	10 cm	tapered	
783	183.30	298.40	1A	24 x 24 cm	circular	19 cm	straight	

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
784	179.00	283.65	1	25 x 22 cm	circular	38 cm	straight	Baytown
787	TP 16	L-5	12					Baytown & Grit
788	182.98	304.75	8	n/a	irregular	n/a	irregular	Indet. Miss.
790	180.00	287.40	4	51 x 48 cm	circular	6 cm	basin-shaped	Baytown
792	180.20	288.20	12					Baytown
793	181.00	289.65	1	30 x 30 cm	circular	26 cm	tapered	1 Baytown Plain
794	181.68	289.65	1	26 x 25 cm	circular	32 cm	irregular	Baytown & Grit
796	181.48	288.89	1	22 x 22 cm	circular	25 cm	tapered	
797	181.40	288.60	1	21 x 20 cm	circular	22 cm	tapered	
798	181.55	288.18	4	45 x 36 cm	circular	13 cm	basin-shaped	
799	181.90	286.55	1	20 x 19 cm	circular	21 cm	tapered	1 Baytown Plain
800	181.70	285.90	4	45 x 38 cm	circular	5 cm	basin-shaped	1 Baytown Plain
801	182.15	289.40	2	38 x 35 cm	square	33 cm	straight	Baytown
802	182.93	286.36	1	38 x 37 cm	circular	26 cm	V-shaped	Baytown
803	182.95	287.50	4	72 x 70 cm	circular	10 cm	basin-shaped	4 Baytown Plain
804	183.25	287.35	1	12 x 11 cm	circular	43 cm	tapered	
807	184.50	287.65	4	40 x 33 cm	oval	15 cm	basin-shaped	Baytown
808	185.38	287.15	1	19 x 19 cm	circular	11 cm	basin-shaped	
810	185.50	288.29	1	17 x 17 cm	circular	10 cm	tapered	1 Baytown Plain
811	183.80	289.50	1	16 x 16 cm	oval	28 cm	straight	4 Baytown Plain
812A	183.32	289.78	5	43 x 42 cm	circular	43 cm	straight	
812B	183.32	289.78	1	43 x 42 cm	circular	40 cm	tapered	

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
815	185.80	289.03	1	30 x 25 cm	oval	25 cm	tapered	3 Baytown Plain
816	185.97	289.10	1	19 x 18 cm	circular	15 cm	tapered	
817	186.16	289.26	1	26 x 20 cm	circular	20 cm	U-shaped	
818	186.42	289.29	1	19 x 19 cm	circular	27 cm	tapered	Baytown
819	186.67	289.92	1	40 x 40 cm	circular	43 cm	tapered	Baytown
820	186.70	289.96	1	14 x 13 cm	circular	15 cm	tapered	
822	187.95	288.60	4	46 x 43 cm	circular	6 cm	basin-shaped	Baytown
823	187.62	288.90	10	43 x 33 cm	irregular	4 cm	basin-shaped	1 Baytown Plain
824	187.55	289.85	2	48 x 45 cm	square	22 cm	straight	Baytown
825	188.15	290.65	1	17 x 12 cm	oval	24 cm	U-shaped	
826	187.83	289.90	1	20 x 18 cm	circular	23 cm	V-shaped	3 Baytown Plain
827	188.40	290.10	3	54 x 21 cm	circular	21 cm	basin-shaped	Baytown & Grit
828	189.35	289.81	1	23 x 23 cm	circular	51 cm	straight	Baytown
829	190.42	289.65	3	53 x 53 cm	oval	11 cm	basin-shaped	Baytown
830	186.90	298.05	1	23 x 19 cm	circular	63 cm	tapered	
831	186.90	298.38	1	17 x 16 cm	circular	56 cm	tapered	1 Baytown Plain
833	186.90	299.80	1	30 x 25 cm	circular	30 cm	straight	
834	180.02	287.39	1	18 x 16 cm	circular	21 cm	tapered	
835	183.13	287.50	1	16 x 15 cm	rcular	25 cm	straight	Baytown
837	181.55	289.95	1	21 x 20 cm	oval	18 cm	tapered	1 Baytown Plain
839	186.12	289.56	1	10 x 9 cm	circular	11 cm	tapered	
841	180.85	284.75	4	230 x 77 cm	elongated	34 cm	basin-shaped	Baytown & Grit

TABLE IX-1. SUMMARIZED FEATURE DATA.
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FEATURE NUMBER	PROVENIENCE North	PROVENIENCE South	FEATURE CATEGORY	HORIZONTAL MEASUREMENTS	HORIZONTAL CONFIGURATION	VERTICAL MEASUREMENTS	VERTICAL CONFIGURATION	CULTURAL AFFILIATION
842	182.40	284.50	4	116 x 96 cm	oval	24 cm	basin-shaped	Baytown & Grit
843	168.77	285.80	4	46 x 41 cm	circular	16 cm	basin-shaped	
844	180.98	284.15	3	58 x 43 cm	circular	4 cm	straight	1 Baytown Plain
900	181.75	284.20	3	66 x 45 cm	circular	16 cm	basin-shaped	Baytown
901	181.60	284.20	1	30 x 23 cm	circular	12 cm	tapered	Baytown
902	181.65	284.31	1	25 x 23 cm	circular	46 cm	tapered	
903	175.00	292.45	5	46 x 42 cm	oval	29 cm	tapered	Baytown, Miss., & Grit
904	Trench 5	Trench 5	12	55 x cm	unknown	39 cm	basin-shaped	3 Baytown Plain
905	177.50	295.60	8	115 x 60 cm	elongated	20 cm	basin-shaped	Baytown
906	177.25	296.00	2	42 x 30 cm	rectangular	8 cm	straight	1 Baytown Plain
907	171.65	283.30	4	50 x 37 cm	oval	22 cm	basin-shaped	
908			12					3 Baytown Plain
1001	181.15	293.30	3	78 x 76 cm	circular	13 cm	basin-shaped	Baytown & Grit
1002	181.05	292.52	1	21 x 21 cm	circular	31 cm	U-shaped	3 Baytown Plain
1003	171.65	283.30	4	62 x 62 cm	circular	27 cm	basin-shaped	Baytown & Grit

APPENDIX X

ARTIFACT ANALYSES

In addition to the floral and faunal remains, other artifact classes were recovered during the course of the investigations at 3CT50. Included were prehistoric ceramics and lithics, a small amount of groundstone and fire-cracked rock, and bone tools. Although historic artifacts were recovered from the site's surface and scattered throughout strata Ip and I, all were recent discard and not subjected to a more detailed analysis.

These other artifact classes (ceramics, lithics, groundstone, fire-cracked rock, and worked bone) will be described in the following sections. Each discussion has been ordered in the same manner: an introduction; a summary of the research questions which guided the particular analysis; the methods used in the analysis; and the results. The implications of the data are presented throughout Chapter Five of Volume I.

The analyses were conducted by various NWR senior personnel who also authored the following discussions. The analysts, and their respective subjects were: Carol S. Weed and Barbara Ribling (prehistoric ceramics and worked bone); and A. Merrill Dicks (lithics, groundstone and fire-cracked rock).

CERAMIC ANALYSIS

The largest number of artifacts recovered from the 3CT50 excavations, excluding faunal remains, were prehistoric ceramics. Overall, the ceramic collection was dominated by plainwares. The low incidence of decorated ceramics had not been totally unexpected; however, the

uniformity of ceramic design elements and the sheer redundancy of design motifs was somewhat startling. To a degree, these factors obviated addressing certain research questions which had been posed at the outset of the site investigations. Nonetheless, it was possible to draw conclusions as to temporal components represented at the site and inter-site variation in occupations.

Research Orientation

From the outset of investigations, seven research questions guided the ceramic analysis. The orientation of the first four questions was toward the definition of the occupations at the site. These were:

1. Did the ceramics present at the site support the contention that the site was utilized during the Baytown and Mississippian periods (Iroquois 1979).

2. From the ceramic evidence, was it possible to distinguish a transition phase from the Baytown occupation to the Mississippian occupation.

3. From the ceramic evidence, was it possible to define subphases with the Baytown phase occupation.

4. Based on the ceramic evidence, were occupations other than Baytown or Mississippian present at the site.

Additionally, collection specific questions dealing primarily with the technological aspects of the various ceramic types, and the possible cultural implications of changes in temper inclusions were also addressed. These three questions were:

5. Research conducted by Klinger et al. (1984) at the Brougham Lake site suggested that a transition ceramic type, marked by a combination of shell and grog temper, would be present in late Baytown/early Mississippian ceramic collections. Could this particular temper combination be identified in the Little Cypress Bayou ceramic collections?

6. The Brougham Lake ceramic collections also included a "grit tempered" type, marked by a paste which consisted of "a sand or fine-grained grit temper" (Klinger et al. 1983:270). Klinger et al. (1983:270) assigned this particular type to the Tchula period. Is there evidence to support such a type in the Little Cypress Bayou ceramic collection, and if the type does occur, is it temporally equivalent to the Tchula period?

7. Investigators have recognized the discrete separation, spatially and possibly temporally, of "Barnes" and Baytown occupations in the general project vicinity. Is there any evidence in the 3CT50 ceramic collection of the sand tempered Barnes Plain (q.v. Kennett Plain)? If it does occur, with what other ceramic types is it associated?

With these research questions serving as the guidelines for the ceramic analysis, the analysis proper was approached from a strict type/variety perspective which emphasized the identification of temper types. In the following section, a detailed discussion of the ceramic methods is presented.

Analysis Methods

As noted above, the analysis of the ceramics recovered during the investigations focused on the technological attributes of the ceramics, with particular emphasis on temper inclusions. For this reason, it was impractical to analyze extremely small sherds, as a fresh break could not be made on them without destroying the sherd. Therefore, sherds less than ½ inch in diameter were classified as crumbs. During the Phase I analysis, the crumbs were counted; because of a significant increase in the number of ceramics recovered during Phase II, the crumbs were weighed. In addition to ceramic crumbs, burnt clay was recovered from many of the proveniences. As with the crumbs, the burnt clay (which some times displayed grass or stick impressions) was weighed during Phase II.

The ceramics greater than ½ inch in diameter were subjected to a more detailed analysis. During Phase I, a series of sorting categories based on temper type had been created. As it appeared that these categories had possible temporal significance, they were retained during the Phase II analysis.

Each sherd was classified into one of the sorting categories, with the placement following the cross-section examination of a fresh break on each using a 10 power loop hand lens. Additionally, a representative sample of each temper category was also examined using 30 and 60 power microscope enhancement in order to determine the full range of temper inclusions which might be present in a particular temper class.

In total, four temper classes were recognized during the course of the analysis. These included: grog, shell, sand, and grit. Within these primary classes, subdivisions were also recognized that were based on secondary temper inclusions. These are discussed in the subsequent plainware section. Ceramics within each temper class and secondary class were classified into "types" which were based on the morphological characteristics of the sherds. The "types" included: plain body, plain rim (by rim form), plain base (by vessel form), and plain other (including ceramic coils and basal supports); decorated (by design motif) body, decorated (by design motif) rim; and decorated (unidentified as to design motif). All sherd classes and "types" were quantified by provenience. Essentially, then, a typical sherd classification based on type/variety criteria was completed for the collection.

Results of the Analysis

In total, some 17,027 ceramics greater than 1/2 inch in diameter were analyzed. No included in that total are the 158 sherds which were identified and quantified in the field during the Phase I systematic surface reconnaissance (these are presented on Table 3 of Volume I).

The results of the analyses are summarized on Tables X-1 through X-3. Table X-1 presents the results of the Phase I intensive surface collection and test pit excavations (exclusive of Test Pit 8, which for analysis purposes was considered as part of the Phase II, Block 4 excavation unit). Table X-2 is ordered by the principal Phase II excavation units and areas: all units within the Lower Midden block (including Test Pit 17; Block 3 which encompassed Test Pits 18 to 26; and Block 4, which included Test Pits 8, 16, 27 and 28); and the Upper Midden block units. Table X-3 summarizes the ceramics recovered from the features.

As will be noted on the tables, all decorated sherds are subsumed under the heading Decorated. A detailed breakdown by provenience is presented later in this discussion. Percentages were calculated only on proveniences which yielded ten or more ceramics.

As mentioned earlier, during the Phase I analysis all of the ceramic crumbs and pieces of burnt clay had been counted. This time consuming procedure was slightly alleviated during Phase II when a cumulative weight by provenience was taken on the crumbs and also on burnt clay. Therefore, on Table X-1 the counts for each are presented, while on Tables X-2 and X-3 weight in grams in presented.

In sum, 1821 crumbs and 674 pieces of burnt clay were recovered during Phase I. From Phase II proveniences, 49,478 gm of crumbs and 30,494 gm of burnt clay were identified. Parenthetically, we would like to note that, based on visual inspection only, the vast majority of the crumbs appeared to be Baytown Plain.

As to the ceramic temper classes and "types" present in the collection, a short discussion of each is presented below. During the course of the analysis references utilized included Brown (n.d.), Phillips et al. (1951), Williams (1954), Phillips (1970), Smith (1978), Million and Morse (1980), Morse (1981), Klinger et al. (1982), Klinger et al. (1983), and Morse and Morse (1983). The assignment of type and variety designations was made based on summary discussions presented in these volumes.

Plainware (by Temper Class)

The plainware category included all non-decorated ceramics and appendages. Plain ceramics were classified by temper class, and plain rims were described by form. Appendages such as rim straps or podal supports were so noted on the analysis forms.

TABLE X-1. RESULTS OF THE PHASE I CERAMIC ANALYSIS.
(Page 1 of 2)

Provenience Unit	Provenience Level	Crumbs/ Burnt Clay	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Tempered #	Grit Tempered %	Neely's Ferry Plain #	Neely's Ferry Plain %	Sand Tempered #	Sand Tempered %
CSC													
N150/E265		7/0	12	9	75.0	2	16.7					1	8.3
N150/E270		14/2	15	13	86.7	1	6.6			1	6.6		
N150/E275		1/0	4	4									
N150/E280		-	3	3									
N150/E285		-	1	1									
N150/E290		-	2	2									
N150/E305		2/0	1	1									
N150/E310		-	3	3									
N155/E265		44/10	37	25	67.5	5	13.5			7	18.9		
N155/E270		27/0	24	19	79.1	3	12.5					2	8.3
N155/E275		16/1	23	22	95.6	1	4.3						
N155/E280		1/0	0										
N155/E285		2/0	1			1							
N155/E290		3/0	5	3		1						1	
N155/E295		5/0	9	9									
N155/E300		3/0	5	5									
N155/E305		2/1	6	4		1						1	
N155/E310		11/0	14	13	92.8	1	7.1						
N160/E270		1/8	13	12	92.3	1	7.7						
N160/E275		3/0	16	12	75.0	1	6.2			2	12.5	1	6.2
N160/E280		6/0	9	9									
N160/E285		12/0	11	5	45.4	6	54.5						
N160/E290		14/1	6	5						1			
N160/E295		10/0	15	13	86.6	2	13.3						
N160/E300		17/0	19	19									
N160/E310		17/0	5	3		1						1	
N160/E315		10/7	10	9	90.0	1	10.0						
N165/E270		5/1	19	16	84.2	1	5.2			1	5.2	1	5.2
N165/E275		18/0	8	6		1						1	
N165/E280		41/0	18	14	77.7	3	16.6			1	5.5		
N165/E285		3/0	31	29	93.5					2	6.4		
N165/E290		17/0	8	8									
N165/E295		4/0	23	21	91.3					2	8.6		
N165/E300		11/1	7	6		1							
N165/E305		-	14	14									
N165/E310		20/0	12	10	83.3	2	16.6						
N165/E315		20/2	16	12	75.0	3	18.7					1	6.2
N170/E270		10/4	13	10	76.9	2	15.3			1	7.6		
N170/E275		7/2	11	10	90.9					1	9.0		
N170/E280		8/3	7	6		1							
N170/E300		12/0	11	11									
N170/E310		2/0	8	8									
N175/E285		7/1	3	1		1				1			
N175/E290		19/4	36	32	88.9	1	2.8			2	5.5	1	2.8
N175/E295		4/0	12	11	91.6	1	8.3						
N175/E305		8/0	11	11									
N175/E310		11/0	12	9	75.0	3	25.0						
N175/E315		6/1	11	10	90.9	1	9.1						
N180/E270		6/0	12	8	66.6	4	33.3						
N180/E275		17/0	21	17	80.9	2	9.5			2	9.5		
N180/E280		22/0	22	19	86.3	3	13.6						
N180/E295		3/0	17	15	88.2	1	5.8			1	5.8		
N180/E300		-	3	3									
N185/E285		11/4	18	16	88.8	2	11.1						
N185/E290		3/0	3	3									
N185/E295		15/1	13	13									
N185/E300		10/1	19	16	84.2	3	15.7						
N185/E305		23/10	16	16									
N185/E310		11/0	13	11	84.6	2	15.3						

TABLE X-1. RESULTS OF THE PHASE I CERAMIC ANALYSIS.
(Page 2 of 2)

Provenience		Crumbs/ Burnt Clay	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Tempered #	Grit Tempered %	Neely's Ferry Plain #	Neely's Ferry Plain %	Sand Tempered #	Sand Tempered %
Gen. Surf. Spoils		-	9	1		7				1			
Test Pits													
Unit	Level												
TP 1	Ap	24/19	5	2						3			
	1	70/9	52	37	71.1	7	13.5			8	15.4		
	2	2/4	8	8									
	3	1/0	1	1									
TP 2	1	11/3	5	4		1							
	2	-	1	1									
	3	-	2	2									
	6	7/0	2	2									
	7	27/4	8	5		3							
	8	87/19	23	21	91.3	2	8.6						
	9	59/20	41	41									
	10	39/12	18	9	50.0	9	50.0						
	11	4/2	5	5									
TP 3	Ap	-	1	1									
	I	-	2	2									
	II	9/0	7	6		1							
	II/III	-	1	1									
	IV	1/0	0										
	5	397/135	60	55	91.6	5	8.3						
TP 4	1	20/3	12	11	91.6	1	8.3						
	2	-	1	1									
	3	3/6	2	2									
	4	279/238	174	149	85.6	25	14.3						
	5	14/70	69	56	81.1	13	18.8						
	6	15/14	18	13	72.2	5	27.7						
	7	13/17	14	14									
TP 5	Ip	18/0	3	3									
	III	1/0	0										
	1	66/24	24	20	83.3	4	16.6						
	3	3/5	1			1							
TP 6	7	3/0	2	2									
	8	-	5	5									
TP 7	5	2/0	0										
TP 9	12B	25/0	13	13									
	12C	17/0	10	10									
TP 10	5	4/0	5	5									
	5/6	1/0	0										
	6	1/0	0										
TP 12	1/2	3/3	0										
TP 14	5	9/2	20	20									
	6	-	4	4									
TP 15	1	4/0	0										

TABLE X-2. RESULTS OF THE PHASE II EXCAVATION UNIT CERAMIC ANALYSIS.
(Page 1 of 2)

Provenience Unit	Level	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Tempered #	Grit Tempered %	Neely's Ferry Plain #	Neely's Ferry Plain %	Sand Tempered #	Sand Tempered %
Lower Midden													
TP 17	4	265/24	107	94	87.8	5	4.6			6	5.6	2	1.8
Block 3													
TP 18	S1/2	410/72	127	119	93.7	6	4.7			2	1.5		
	1B	15/21	16	9	56.2	6	37.5	1	6.25				
	$1B_1$	57/30	41	38	92.6	3	7.3						
	2	428/36	102	89	87.3	11	10.8			2	1.9		
	3	98/68	59	53	89.8	6	10.1						
	5	316/41	127	111	87.4	12	9.4			4	3.1		
TP 19	2B	221/51	90	76	84.4	14	15.5						
	3	1475/152	443	396	89.4	42	9.5			1	.2	4	.9
	4	2732/298	629	567	90.1	51	8.1			10	1.6	1	.15
	5	1981/252	444	398	89.6	39	8.7			2	.4	5	1.1
	6	51/0	30	26	86.6	4	13.3						
TP 20	4	30/19	20	15	75.0	5	25.0						
	5	2306/229	568	511	89.9	45	7.9			10	1.8	2	.3
	6	2140/318	603	534	88.5	55	9.1			11	1.8	3	.5
	7	1518/224	301	270	89.7	28	9.3			2	.6	1	.3
	8	472/49	102	87	85.2	15	14.7						
	9	41/11	17	16	94.1	1	5.8						
TP 21	2	727/60	184	162	88.0	20	10.8			2	1.1		
	3	155/14	25	21	84.0	3	12.0					1	4.0
TP 22	S1/2	62/19	69	59	85.5	7	10.1			3	4.3		
	3	1453/106	312	279	89.4	23	7.3			9	2.8	1	.3
	4	1261/185	281	245	87.1	24	8.5			10	3.5	2	.7
	5	1529/278	351	314	89.4	27	7.7			7	1.9	3	.8
	6	254/16	39	35	89.7	3	7.6			1	2.5		
	7	6/5	0										
TP 23	5	330/29	154	137	88.9	15	9.7			1	.6	1	.6
	5B	156/13	99	92	92.9	6	6.0					1	1.0
	$5B_1$	330/49	173	145	83.8	27	15.6			1	.6		
	6	2909/428	657	549	83.5	94	14.3			12	1.8	2	.3
	7	1548/169	328	288	87.8	34	10.3			6	1.8		
	8	349/25	69	56	81.1	13	18.8						
TP 24	2	131/11	34	25	73.5	3	8.8			6	17.6		
	3	147/19	15	8	53.3	3	20.0			4	26.6		
	4	0/7	0										
TP 25	Gen.	56/6	16	11	68.75	2	12.5			3	18.7		
	3	488/42	54	43	79.6	9	16.6			1	1.8	1	1.8
	4	992/89	152	129	84.8	17	11.2			5	3.2	1	.6
	5	1462/319	307	272	88.6	25	8.1			4	1.3	6	1.9
	6	981/111	189	163	86.2	21	11.1			3	1.5	2	1.0
	7	136/46	32	28	87.5	4	12.5						
	8	5/0	2			2							
TP 26	6	1835/110	413	349	84.5	45	10.9			18	4.3	1	.2
	7A	2156/251	451	366	81.1	72	15.9			10	2.2	3	.6
	7B	1528/50	223	195	87.4	24	10.7			3	1.3	1	.4
	8	499/121	93	82	88.1	11	11.8						
	9	38/19	13	9	69.2	4	30.7						

TABLE X-2. RESULTS OF THE PHASE II EXCAVATION UNIT CERAMIC ANALYSIS.
(Page 2 of 2)

Provenience Unit	Level	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Tempered #	Grit Tempered %	Neely's Ferry Plain #	Neely's Ferry Plain %	Sand Tempered #	Sand Tempered %
Block 4													
TP 8	7A	-	1	1									
TP 16	2A	171/133	150	132	88.0	10	6.6	2	1.3	3	2.0	3	2.0
	2B	-	9	6		3							
	3	129/76	127	106	83.4	14	11.0			5	3.9	2	1.6
	4A	263/16	86	78	90.6	7	8.1			1	1.2		
	4B	-	11	8	72.7	3	27.2						
	5A	61/13	46	42	91.3	4	8.7						
	5B	-	2	1		1							
TP 27	Z	839/152	209	189	90.4	9	4.3			10	4.8	1	.4
	1	221/85	229	202	88.2	13	5.7			8	3.4	6	2.6
	2	1733/213	423	369	87.2	18	4.2			34	8.0	2	.5
	3	2652/329	620	538	86.8	52	8.3			27	4.3	3	.5
	4	1484/272	344	296	86.0	37	10.7			11	3.2		
	5	216/56	113	100	88.4	10	8.8			1	.9	2	1.8
	6	1/137	19	13	68.4	5	26.3			1	5.2		
TP 28	X	31/6	26	22	84.6	3	11.5	1	3.8				
	Y	30/0	7	7									
	Z	497/54	313	288	92.0	24	7.6					1	.3
	1	840/66	94	81	86.1	6	6.4			7	7.4		
	2	637/58	159	138	86.8	9	5.6			12	7.5		
	3	596/136	158	138	87.3	8	5.1			10	6.3	2	1.2
Upper Midden													
N181/E297	L-2	0/2	3	2				1					
N183/E297	L-2	74/71	102	96	94.1	5	4.9	1	.9				
N183/E299	L-1	16/25	18	16	88.8	2	11.1						
	L-2	14/12	7	7									
	Gen.	0/7	5	4		1							
N185/E290	L-2	21/25	78	71	91.0	5	6.4	2	2.5				
N185/E295	L-2	0/6	3	1		2							
N185/E297	L-2	93/112	183	162	88.5	18	9.8					3	1.6
N185/E299	L-1	277/368	303	277	91.4	15	4.9			10	3.3	1	.3
	L-2	33/126	93	73	78.5	12	12.9	1	1.0	2	2.1	5	5.4
N185/E301	L-1	38/79	66	61	92.4					5	7.5		
N187/E297	L-2	9/12	13	11	84.6	1	7.6			1	7.6		
N187/E299	L-1	39/9	51	45	88.2	2	3.9			4	7.8		
	L-2	64/26	68	63	92.6	2	2.9			3	4.4		
N187/E300	L-1	46/36	47	41	87.2	2	4.2			3	6.4	1	2.1
N187/E301	L-1	9/8	5	5									
	L-2	0/0	1					1					

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 1 of 6)

Feature Number	Crumbs/ Burnt Clay	Total Ceramics	Baytown Plain		Decorated		Grit Temper		Neeley's Ferry Plain		Sand Temper	
	[gm]		#	%	#	%	#	%	#	%	#	%
15	10/0	1			1							
20	0/5											
21	-	1	1									
26	2/0	2	2									
27	-	11	9	81.8	2	18.1						
28	0/109											
29	6/105	21	19	90.4	2	9.5						
30	2/17											
31	4/10											
45	7/0	1					1					
50	5/143	14	14									
56	0/32	3	3									
59	2/0	2	2									
61	13/269	10	7	70.0	3	30.0						
63	-	1	1									
78	5/37	1	1									
81	7/18	1	1									
82	0/1											
86	7/135	10	8	80.0	2	20.0						
90	50/145	29	24	82.7	5	17.2						
92	0/7	3	3									
93A	0/112	25	25									
94	0/114	1	1									
101	0/5	1			1							
102	42/113	33	33									
103	1/0											
107	0/63	1	1									
112	-	1	1									
113	0/2											
114	0/5	1	1									
127	1/0											
132	0/4											
133	0/8	1					1					
138	18/52											
141	1/0											
142	0/1	1	1									
167	0/2											
168	1/0	3			3							
173	0/12											
174	0/9											
178	-	1			1							
195	8/44	12	7	58.3	5	41.6						
196	4/5	3	2								1	

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 2 of 6)

Feature Number	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Temper #	Grit Temper %	Neeley's Ferry Plain #	Neeley's Ferry Plain %	Sand Temper #	Sand Temper %
199	0/3											
204	2/10	1	1									
207	-	1	1									
208	2/36	1	1									
212	3/6	5	4		1							
215	0/5	1			1							
216	1/3											
227	0/4											
228	4/15	6	6									
230	1/1											
254	3/9	3	3									
255	2/0											
256	0/31											
257	11/178	6			1		4				1	
258	2/4											
259	0/1											
267	0/10	5	4		1							
269	11/0	4	3		1							
272	2/0	1	1									
277	0/2											
280	0/8	1	1									
282	4/4	2			2							
284	2/8	3	2				1					
286	2/0	1	1									
287	0/12											
290	13/36	22	20	90.9	2	9.1						
291	0/3											
294	4/756	6	4		2							
295	55/1593	52	47	90.3	5	9.6						
299	14/245	14	13	92.8	1	7.1						
300	22/0	22	10	45.4	5	22.7	7	31.8				
302	34/169	54	42	77.7	7	12.9	1	1.8	2	3.7	2	3.7
303	0/4											
306	56/291	65	56	86.2	5	7.7	4	6.1				
313	3/42	12	12									
314	15/64	5	3		2							
316	5/84	6	5		1							
317	11/571	44	35	79.5	8	18.2	1	2.3				
318	0/30	1	1									
322	0/4	1	1									
323	8/63	6	4		2							
324	4/31	8	4		4							

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 3 of 6)

Feature Number	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Temper #	Grit Temper %	Neeley's Ferry Plain #	Neeley's Ferry Plain %	Sand Temper #	Sand Temper %
327	14/1047	26	22	84.6	3	11.5					1	3.8
330	42/189	52	49	94.2	3	5.7						
331	2/230	28	25	89.3	3	10.7						
332	7/216	30	24	80.0	6	20.0						
334	16/9	2	1		1							
342	18/49	13	10	76.9	3	23.0						
343	22/488	23	20	86.9	3	13.0						
344	0/9	1	1									
345	13/21	25	21	84.0	4	16.0						
348	2/5											
351	189/558	321	268	83.5	29	9.0			19	5.9	5	1.6
354	0/2	1			1							
357	0/35											
359	3/2	3	2		1							
363	8/33	8	7		1							
365	2/12	8	7		1							
366	2/0	2			2							
367	2/3	5	3		2							
368	2/5	1	1									
375	0/3	1			1							
376	23/124	27	24	88.9	2	7.4	1	3.7				
380	8/73	11	11									
381	3/17	1			1							
389	1/6	2	2									
403	27/163	42	37	88.0	5	11.9						
405	-	1	1									
406	2/9	1			1							
407	4/0	3	3									
408	4/34	4	4									
409	5/0	7	7									
410	0/11	3	3									
411	0/25	3	3									
412	5/37	9	9									
413	63/1394	45	39	86.6	6	13.3						
417	23/147	33	29	87.8	4	12.1						
418	0/6											
419	8/1210	30	25	83.3	5	16.7						
420	0/8	1	1									
426	0/20	1	1									
427	0/5											
428	0/58	6	6									
430	41/161	105	79	75.2	12	11.4			14	13.3		
433	20/152	40	33	82.5	7	17.5						

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 4 of 6)

Feature Number	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Temper #	Grit Temper %	Neeley's Ferry Plain #	Neeley's Ferry Plain %	Sand Temper #	Sand Temper %
435	0/9	1	1									
596	1/7	3	2		1							
609	1/0											
610	4/26	20	16	80.0	3	15.0					1	5.0
612	0/1											
613	0/9											
615	0/29											
616	3/3	4	3		1							
617	4/24	7	7									
625	0/3											
635	1/4	4	4									
640	2/8	9	5		2		2					
641	1/0	2	2									
642	<.1/0											
650	3/6	1	1									
652	1/0											
654	53/185	25	20	80.0	4	16.0			1	4.0		
656	23/132	35	30	85.7	5	14.2						
657	1/146	10	7	70.0	3	30.0						
658	10/34	22	15	68.1	7	31.8						
659	20/264	35	27	77.1	8	22.8						
660	4/25	9	8		1							
662	0/3	1	1									
664	2/173	2	1		1							
665	<1/31	1	1									
667	0/6	2	2									
669	0/1											
671	4/24	1	1									
674	0/5											
675	0/<1											
676	2/1											
680	<1/5	1			1							
681	0/4	2	2									
682	12/36	4	4									
683	1/18											
684A	32/83	26	24	92.3	2	7.6						
684B	2/12	1	1									
685	24/168	49	40	81.6	7	14.3	1	2.0			1	2.0
687	0/10	1	1									
688	-	2	2									
689	0/48	16	16									
690	8/419	26	23	88.4	3	11.5						
691	9/31	24					24					
692	0/8											

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 5 of 6)

Feature Number	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Temper #	Grit Temper %	Neeley's Ferry Plain #	Neeley's Ferry Plain %	Sand Temper #	Sand Temper %
693	-	1	1									
694	20/194	21	18	85.7	3	14.3						
698	0/8	2	2									
699	3/7											
700	2/5											
702	0/7											
705	2/4											
719	0/3	7	6		1							
725	9/15	8	5		3							
728	7/266	19	17	89.4	2	10.5						
729	16/106	48	37	77.0	11	22.9						
730	-	2	1		1							
731	<1/0											
733	-	1	1									
735	0/14											
736	2/12	2	1		1							
737	6/84	2	2									
738	0/9	1			1							
739	5/13	5	5									
740	2/8	5	3		2							
744	5/13	3	3									
745	5/20	6	2		4							
746	3/45	15	11	73.3	4	26.6						
747	8/35	9	8		1							
748	<1/576	16	11	68.7	5	31.2						
749	3/521	14	11	78.5	3	21.4						
752	-	2	2									
753	14/0	12	8	66.7	2	16.7			1	8.3	1	8.3
756	15/280	16	16									
758	-	1	1									
762	-	3	1		2							
763	-	4	1		3							
768	3/0	5					5					
769	29/68	46	42	91.3	2	4.3	1	2.2	1	2.2		
771	0/8	4	3		1							
773	4/6	4	2		2							
774	12/48	10	10									
775	1/0	1	1									
776	0/2											
778	4/3	1	1									
779	2/0	2	1		1							
780	2/193											
784	8/48	11	10	90.9	1	9.1						
788	2/24	12	9	75.0	2	16.6					1	8.3

TABLE X-3. SUMMARY OF FEATURE CERAMICS.
(Page 6 of 6)

Feature Number	Crumbs/ Burnt Clay [gm]	Total Ceramics	Baytown Plain #	Baytown Plain %	Decorated #	Decorated %	Grit Temper #	Grit Temper %	Neeley's Ferry Plain #	Neeley's Ferry Plain %	Sand Temper #	Sand Temper %
789	0/4											
790	0/4	4	2		2							
793	-	1	1									
794	0/2	2	1				1					
799	0/9	1	1									
800	-	1	1									
801	29/416	22	20	90.9	2	9.1						
802	8/6	1			1							
803	2/21	4	4									
804	1/2											
807	38/144	54	51	94.4	3	5.5						
808	1/0											
810/816	0/3	1	1									
811	-	4	4									
812	13/2											
815	0/4	3	3									
817	<1/7											
818	3/0	6	5		1							
819	11/5	15	14	93.3	1	6.6						
820	0/4											
822	1/23	5	5									
823	0/7	1	1									
824	6/50	13	11	84.6	2	15.3						
825	<1/6											
826	0/19	3	3									
827	0/894	5	4								1	
828	3/13	2			2							
829	4/0	8	4		4							
830	8/3											
831	2/5	1	1									
833	1/6											
835	0/8	5	3		2							
837	-	1	1									
841	252/1551	259	212	81.9	38	14.7	2	.7			7	2.7
842	113/1128	127	103	81.1	23	18.1	1	.7				
844	0/37	1	1									
900	115/486	64	49	76.5	15	23.4						
901	0/15	7	3		4							
903	14/44	39	30	76.9	3	7.7	2	5.1	4	10.2		
905	97/352	63	60	95.2	3	4.7						
906	0/338	1	1									
1001	19/243	31	26	83.8	4	12.9	1	3.2				
1002	3/1	3	3									
1003	26/184	26	23	88.4	2	7.7					1	3.8

Baytown Plain (grog, grog/sand): The majority of the ceramics (N=14,714; 86.4 percent) were classified as Baytown Plain var. unspecified. Three temper combinations were subsumed under this heading during the final ceramic e aluation. These included grog tempered and fine grog tempered; the latter was thinner and denser than the former and assignment to the category was analytically subjective. A minority of the sherds (N=213, 1.4 percent of Baytown Plain) also had very fine sand inclusions in addition to the grog, and surficially were sandy to the touch. These were not technologically equivalent to the sand tempered Barnes Plain, but rather are most similar to Phillips' (1970:54) description of Baytown Plain var. Thomas, which admittedly is somewhat of a catchall category.

Barnes Plain (sand): Sherds which technologically fit the type description for Barnes Plain (Williams 1954:204; see also the Phillips [1970:43,94-95] discussion of Kennett Plain) were recovered, however, from the Little Cypress Bayou collection (N=110; .65 percent). While in every instance, they co-occurred in proveniences yielding Baytown Plain, in several cases they also co-occurred with other minority types which appear temporally to be Late Baytown. These types included grit tempered and a sandy paste, fine cordmarked which was classified as Barnes Cordmarked (Phillips 1970:43), and a Barnes varietal. The latter is marked by a dominance of sand temper with minor inclusions of shell; the paste, however, is identical to that of the Barnes and for the purposes of classification it is considered a minority Barnes variety.

Neeley's Ferry Plain (shell, shell/grog, shell/grit): Three variations on the shell-tempered theme were identified in the 3CT50 ceramic collections. In each case, the dominant temper element was shell, with only minor expressions of either grog or grit inclusions (N=395; 2.3 percent). Neeley's Ferry Plain (NFP), also referenced by Phillips (1970:130-135) as Mississippi Plain var. Neeley's Ferry is considered to the hallmark type for the Mississippian in the central valley (Morse and Morse 1983). It has been reported, however, in late Baytown (i.e., Coles Creek) contexts in the area (Klinger et al. 1983a and 1983b). At 3CT50, the variety and both unnamed minor varieties co-occurred with both Barnes Plain and, in some instances, grit tempered wares.

Grit temper: As far as can be determined, the grit tempered variety (N=71; .42 percent) identified in the Little Cypress Bayou collection does not have a named equivalent. Klinger et al. (1983) identified a similar pottery "type" at Brougham Lake and assigned it to the Tchula period. At 3CT50, however, the type consistently co-occurred with sand and shell tempered varieties, Barnes Cordmarked and Wheeler Check Stamped. This suggests that at least at 3CT50, its appearance temporally coincides with Late Baytown/Mississippian. It should be noted that in several instances (Features 133, 300 and 433, and the Upper Midden) this temper type was used in the construction of podal supports. The possibility should be considered that the addition

of grit to the clay matrix may have functioned as a strengthening agent and that, as such, this temper addition does not mark a "type" in the classic sense.

Decorative Elements

While decorated ceramics were present in the Little Cypress Bayou collection, as we noted at the outset of this section, stylistically the decorated collection was marked by a redundancy of design element use and a subjective lack of innovation. In total, decorated wares accounted for only 10.2 percent (N=1737) of the analyzed collection. Of this percent, slightly less than 60 percent were cordmarked. Table X-4 presents a detailed summary of the various decorated types which were recovered during both phases of work. The different decorative techniques, and the classification of the them into named types and varieties, where possible, is presented below.

Mulberry Creek Cordmarked (Class A): As noted, the dominant decorative technique identified in the 3CT50 collection was cordmarking (N=1031). Six cordmarked varieties were present, and included a wide, loose-wrap cord (A1; N=36); a fine, tight-wrap cord (A2; N=603, Figure X-1a, b); a fine cord which was cross applied (A3; N=74); a fine cord that had been oversmoothed (A4; N=2); a fine cord which had been applied in zones (A5; N=2); and eroded cordmarked (A6; N=314, Figure X-1c) which could not be subclassified further. Almost without exception, these decorative techniques were found on grog paste. However, 14 of the fine cordmarked sherds were on a sandy, "Barnes" paste and are considered Barnes Cordmarked. These were recovered from Features 433, 658, 694, 729, 841; Test Pit 25, Level 5; Test Pit 26, Levels 6, 7A and 8; and Test Pit 28, Stratum Ip.

Incised (Class B): Two varieties of incising, differentiated by vessel portion, were identified in the collection: B1) incised rims (N=94); and B2) incised body (N=67). The most common use of incising was as a rim treatment. Rim incisions varied from deep notching (Figure X-2) to very shallow incisions or possible dowel impressions. Single line incisions encircling a folded rim were also identified on two specimens. Although several pieces exhibited incised line treatment on body sherds, in almost every case the ceramics were eroded and definite assignation to one of the incised types was not attempted. Rim incising, however, is found on Baytown period types such Alligator Incised (Phillips 1970:39). The pinched rim mode found on Alligator Incised is present in the 3CT50 collection (Figure X-2c, d and f).

Punctate (Classes C, D and J): Evansville Punctate (Phillips 1970:78) includes varieties such as fingernail impressing (Class C; N=13), reed punctations (Class D; N=36, Figure X-1d) and thumb/forefinger pinching (Class J; N=1). Examples of all three techniques were identified from 3CT50 ceramic collection. The incidence level of each, however, precludes further discussion except to say that their presence reinforces the idea of Baytown and post-Baytown occupations at the site.

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 1 of 7)

A = Cordmarked
- A1 = Cordmarked, wide cord
- A2 = Cordmarked, fine cord
- A3 = Cordmarked, cross cord
- A4 = Cordmarked, cord smoothed
- A5 = Cordmarked, zoned cord
- A6 = Cordmarked, eroded

B = Incised
- B1 = Rim, usually incised on top
- B2 = Body

C = Fingernail Impressed

D = Punctate

E = Check Stamped

F = Rocker Stamped

G = Dowel Impressed

H = Corncob Impressed

I = Brushed

J = Pinched

K = Rim, decorated through pinching, scalloping or applique

L = Eroded Decorated

M = Baked clay ball

Provenience: Unit / Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
	Phase I																		
CSC:																			
N150/E265	1					1													
N150/E270	/1																		
N155/E265	3					1			1										
N155/E270						2/1													
N155/E275		1																	
N155/E285						1													
N155/E290									1										
N155/E305								1											
N155/E310						1													
N160/E270						1													
N160/E275			1																
N160/E285	2	1				2/1													
N160/E295		1				1													
N160/E310						1													
N160/E315							1												
N165/E270		1																	
N165/E275						1													
N165/E280	1	1							1										
N165/E300						1													
N165/E310							1		/1										
N165/E315			2			1													
N170/E270		1					1												
N170/E280	1																		
N175/E285										1									
N175/E290		1																	
N175/E295			1																
N175/E310	1	/1				1													

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 2 of 7)

Provenience Unit	Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
CSC (Cont'd):																				
N175/E315			1																	
N180/E270		1	1	1				1												
N180/E275		1								1										
N180/E280			1				2													
N180/E295			1																	
N185/E285			2																	
N185/E300			1	2																
N185/E310			1				1													
Test Pits:																				
TP 1	1	1	3				3													
TP 2	1	1																		
	7		2				1													
	8	1	1																	
	10		9																	
TP 3	II																		1	
	5		1	1			1				1								/1	
TP 4	1	1																		
	4	2/2	6	5								9/1								
	5		5						1		1	1						/1	4	
	6		1/1						1		2									
TP 5	1		2					2												
	3		1																	
Phase II																				
Lower Midden:																				
TP 17	4		2				1	1			1									
Block 3:																				
TP 18	S1/2		4								1								1	
	1B						3		4										2	
	2		7					1											3	
	3		2				3												1	
	5		4				2		1			1							4	

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 3 of 7)

Provenience Unit	Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
Block 3 (Cont'd):																				
TP 19	2B		7/1	1															5	
	3		10	1	/1		12/2	1											14/1	
	4		15/3				6/1	2			1/2	4							15/2	
	5		16	1			7	1	2			1	1					1	8/1	
	6						4													
TP 20	4		2				1	1											/1	
	5		32/1					2			2								8	
	6		23/1	2			3	1			1/1	3							19/1	
	7		8				3	1	2		4	1						1	8	
	8		8				1												6	
	9		1																	
TP 21	2		5				5	2	1	1									6	
	3																		3	
TP 22	S1/2		/1				3												3	
	3		5/1				5			/1									10/1	
	4		7/1				6		3						1				5/1	
	5		4				7	2	1										12/1	
	6	1					1			/1										
TP 23	5		5					2		/1	/1								4/2	
	5B	1	8	2/1				1	1		/1								17/1	
	6	7	25/3	3			27/3	2	5	1/1		1						1	15	
	7	4	10	1			10/1	3	1			/1							2/1	
	8		2/1	1			6												3	
TP 24	2							1											2	
	3						2		1											
TP 25	Gen.						1												1	
	3		2/1				2		2										2	
	4		3				3		1										10	
	5		7/4	2			3	2	1										6	
	6		6				5	1			1								8	
	7		3																1	
	8		/1					1												
TP 26	6		12/1	1			13	4			/5								9	
	7A		23/5				20	6	2										15/1	
	7B		9	1			6/1		1									/1	5	
	8		1				6	1											2/1	
	9		2					1											1	

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50. (Page 4 of 7)

Provenience Unit	Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
Block 4:																				
TP 16	2A		1				4	1				1							3	
	2B		2/1																	
	3		5				3	1			/1								4	
	4A						4	1											2	
	4B		2				1													
	5A							1			1								2	
	5B																		1	
TP 27	Z		2	1				2											4	
	1		3				1	1	1										7	
	2		2				1	3											12	
	3		5			2	8/2	10		1								4	19/1	
	4		3/2					3	7/3									1	17/1	
	5		2/1	3/1															3	
	6						1												3/1	
TP 28	X		1				2													
	Z		10	3			5/2		1										3	
	1			1			5													
	2		4				1				1								3	
	3		2	1				2											3	
Upper Midden:																				
N183/E297	L-2		3																2	
N183/E299	L-1		1																1	
	Gen.																		1	
N185/E290	L-2							1					1						3	
N185/E295	L-2																	/2		
N185/E297	L-2		10/1	1			4												2	
N185/E299	L-1	1	2/1				3	3											5	
	L-2		8				1	1											2	
N187/E297	L-2		1																	

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 5 of 7)

Provenience Unit	Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
Upper Midden (Cont'd):																				
N187/E299	L-1								1										1	
	L-2																		2	
N187/E300	L-1													/1					/1	
Features:																				
15							1													
27			1				1													
29							1		1											
61				2															1	
86			2																	
90			1	2			2													
101																			1	
168			2																1	
178			1																	
195			/1	/1			2												1	
212			1																	
215																			1	
257											/1									1*
267			1																	
269							1													
282			1				1													
290			2																	
294			1													/1				
295			1/1					1								1			1	
299																			1	
300			2/1				1					1								
302			3/1					1	1									1		
306			2/2									1								
314							1	1												
316																/1				
317			1/2				1					1							2/1	
323																			2	
324							1												3	
327			3																	
330			1																2	
331			/1				2													

*The clay ball is not counted on Table X-3 (page 2 of 6).

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 6 of 7)

Provenience Unit Level	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
Features (Cont'd):																			
332		/1				1	1	1										2	
334		1																	
342						3													
343		1/1								1									
345		1				1	1											1	
351		14/3				3	3	2	1								2	/1	
354							1												
359								1											
363		1																	
365																		1	
366		2																	
367			1															1	
375		1																	
376		1	1																
381		1																	
403		4								/1									
406																		1	
413		2				/1	1	1										/1	
417		2																2	
419		2																3	
430		2				1	7				1		1						
433		3	1			1	1									1			
596		1																	
610		1/1																	1
616																			/1
640		2																	
654		1				1													2
65[illegible]						1		1											2/1
657		1		/1				1											
658		2				3					1								1
659		2/2				2									/1				1
660		1																	
664		1																	
680		1																	
684A		1				/1													
685		3	1			2		1											
690		3																	
694		2				1													

TABLE X-4. DECORATED CERAMICS RECOVERED FROM THE CONTROLLED SURFACE COLLECTION, EXCAVATION UNITS AND FEATURES AT 3CT50.
(Page 7 of 7)

Provenience	A1	A2	A3	A4	A5	A6	B1	B2	C	D	E	F	G	H	I	J	K	L	M
Features (Cont'd):																			
719																			1
725											1		/2						
728	1					1													
729		9																	2
730						/1													
736																			1
738										/1									
740		2																	
745		4																	
746		2/1																	1
747		1																	
748		2/1				1													1
749		1						2											
753		2																	
762						1									1				
763								3											
769						2													
771																			1
773		2																	
779		1																	
784		1																	
788		2																	
790							1								1				
801		1								/1									
802																			1
807						2/1													
818		1																	
819						1													
824	1	1																	
828		2																	
829		2/1																	1
835						2													
841		11	1			5	1	5											14/1
842		10	3																10
900		7/1					1	1		1					1				3
901		1/1				1									1				
903		2						1											
905						2				/1									
1001		2				1		1											
1003		1				1													

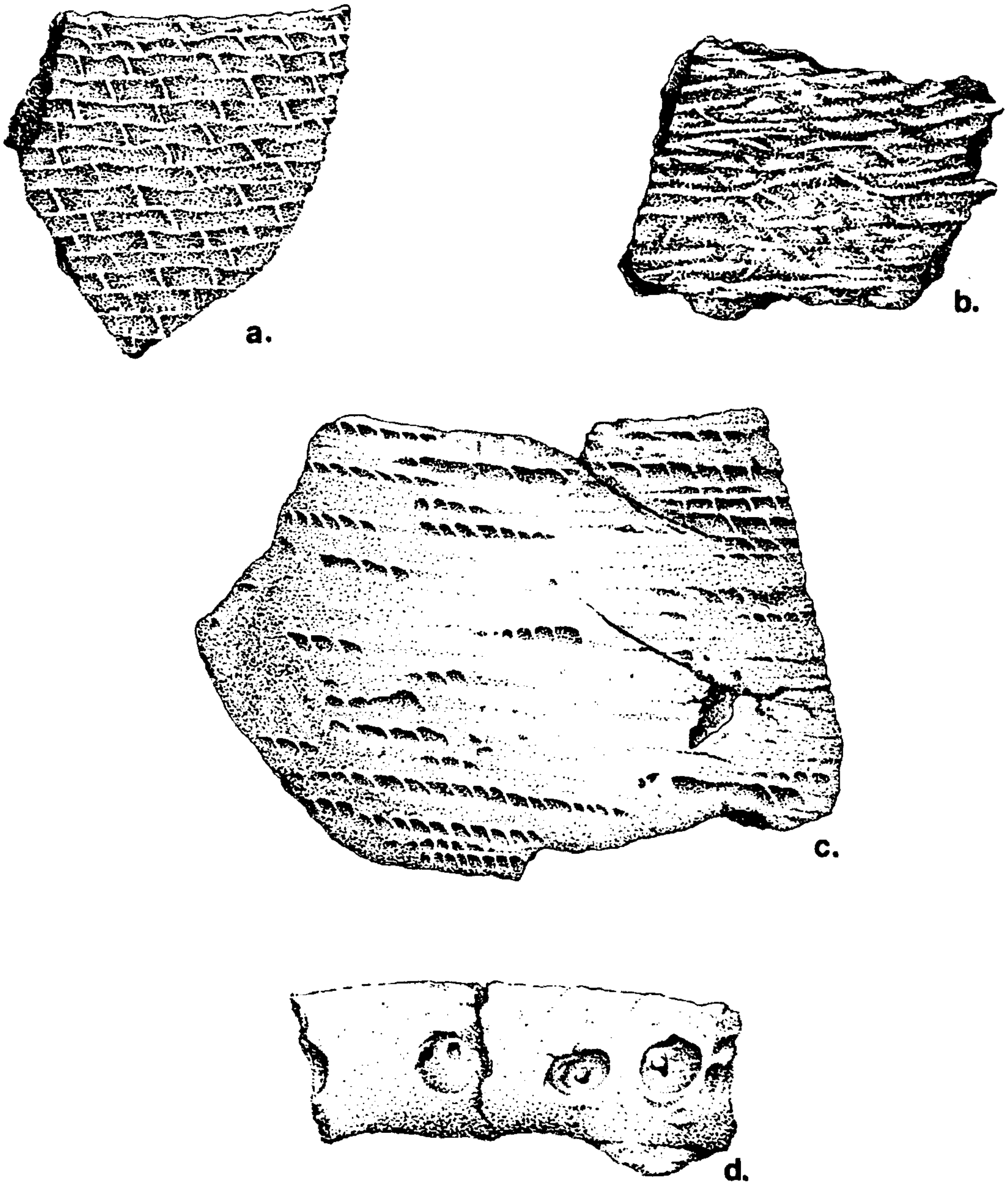

FIGURE X-1. CORDMARKED AND FUNCTATE CERAMICS RECOVERED FROM 3CT50.

a,b) Mulberry Creek Cordmarked (fine cord), Feature 658
c) Eroded Cordmarked, N185E297, Level 2
d) Evansville Punctate rim, Test Pit 23, Level 5

Note: the cordmark elements have been emphasized for the illustration and should not be considered check stamped.

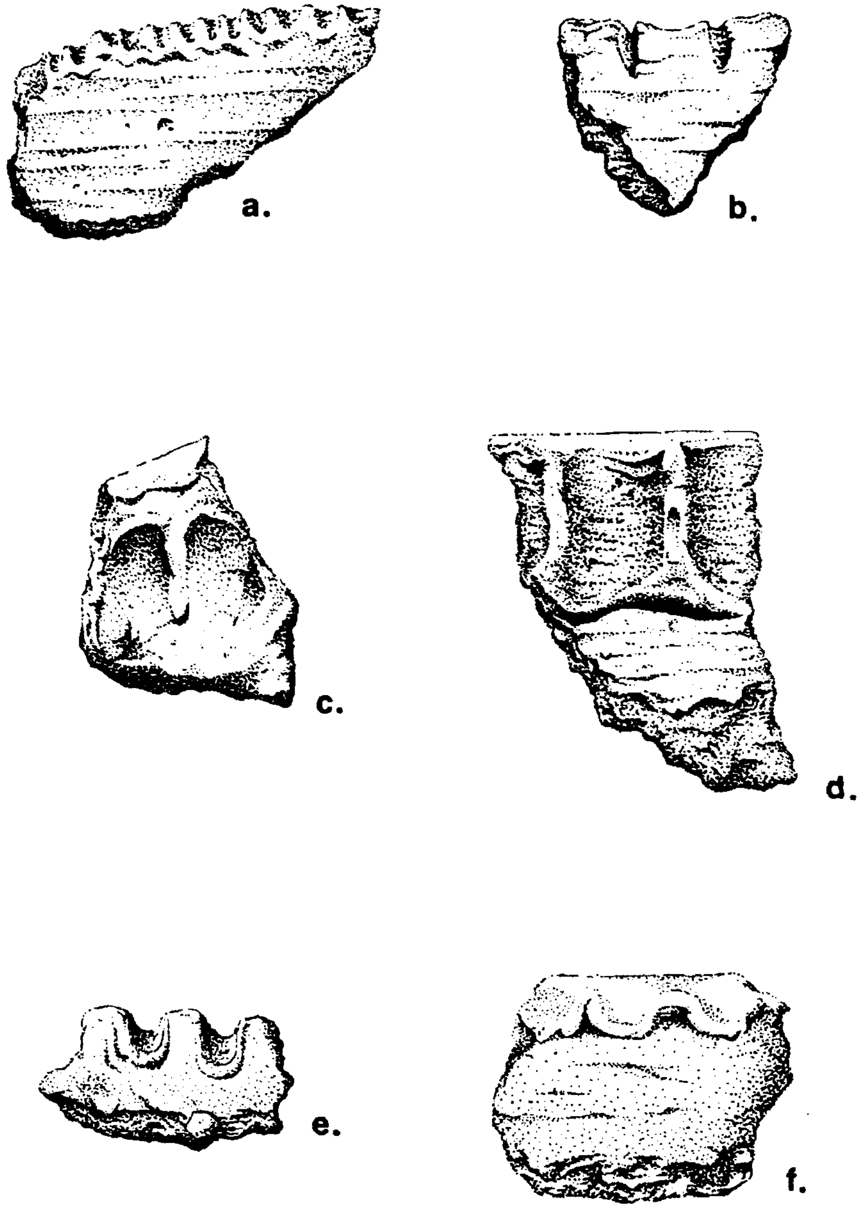

FIGURE X-2. DECORATED RIMS.

a,b) Incised rims, Test Pit 27, Level 3
c,d) Pinched rims, Test Pit 27, Level 3
e) Notched rim, Test Pit 19, Level 3
f) Pie crust rim, Test Pit 19, Level 3

Check Stamped (Class E): Check stamped ceramics were recovered from seven features and six test units (N=30; see Table X-4). Except for a single occurrence of check stamping in Feature 725, all the remaining examples were recovered from proveniences which also yielded Late Baytown or Mississippian sherds, in addition of course to the ubiquitous Baytown Plain. While the decorative technique most closely resembles the land size and form associated with Wheeler Check Stamped, as was the case with Phillips (1970:171) we have reservations about applying the Wheeler nomenclature to this decorative element. Given the size of the 3CT50 check stamped sample size, it would be pretentious to call for the creation of a new type or even variety; at present, we prefer to recognize the use of the decorative technique without type/variety nomenclature.

Rocker Stamped (Class F): Unexpectedly, two rocker stamped sherds were identified, one each from the Lower and Upper Middens (respectively, Test Pit 19, level 5 and N185/E290, level 2). Rocker stamping is not a common decorative element in the Lower or Central Mississippi River valley sequences, and the implications of its occurrence in the 3CT50 collection are unknown. In neither case were complete elements present, though the paste on each would suggest Chevalier Stamped rather than Indian Bay Stamped (see Phillips 1970:64-65, 91-93).

Impressed (Classes G and H): Four dowel impressed sherds, three of which were rims, were recovered: one rim from the Upper Midden (N187/E300, level 1); one body piece from Feature 430; and two rims from Feature 725. In all instances, the dowel was not wrapped, and the impression was smooth and gently curved.

A single corncob impressed sherd was identified from the Lower Midden (Test Pit 22, level 4). The provenience also yielded Late Baytown and Mississippian-associated types.

Brushed (Class I): The nine brushed sherds (see Table X-4) were identified in feature collections. The brushing is asymmetrical and rather erratically executed, and most closely resembles Mississippian types further to the east (see Stacy 1964).

Modified Rims (Class K): Several rims which had been modified through pinching, scalloping or applique were recovered; in all instances they were found on grog tempered ceramics.

Eroded Decorated (Class L): In many cases, while it was apparent that the sherd had at one time exhibited a design motif, through erosion and breakage it was no longer possible to assign the decorative element to a specific technique. In these instances, the sherds were classified as eroded decorated.

Baked Clay Ball (Class M): A single baked clay ball was recovered from Feature 257, in association with an Evansville Punctate, grit tempered and "Barnes" Plain. Klinger et al. (1983) reported a similar

object from Brougham Lake. There is no evidence in the 3CT50 collection to suggest that the ball is a Poverty Point object.

Ceramic Summary

The 3CT50 ceramic collection supports the argument for Baytown and post-Baytown occupations at the site. The assemblage was dominated by Baytown Plain, with minority occurrences of Barnes Plain, Neeley's Ferry Plain, and an unnamed grit tempered plain. The decorated assemblage was predominantly Mulberry Creek Cordmarked, with minor expressions of other decorated types.

LITHIC AND GROUNDSTONE ANALYSIS

The analysis of the lithic artifacts recovered from the Little Cypress Bayou site involved categorizing and identifying attributes of the lithics which when summarized could be used in addressing the research questions presented in Chapter Three (Volume I) and questions, presented below, which were specific to the lithic collection. In sum, the analysis was directed toward producing data applicable to the resolution of questions regarding: 1) culture history; 2) artifact/assemblage function; and 3) prehistoric exploitation of raw materials.

Regrettably, the low incidence of lithics recovered from the site was not conducive to addressing questions about the area cultural sequence. Despite, however, the relatively low numbers, the questions concerning artifact/assemblage function and the implications of the exploitation of particular raw materials could be evaluated.

Research Questions

From the outset of the lithic analysis, it was apparent that the collections were heavily biased in favor of lithic debitage (principally interior flakes and shatter/pressure flakes). The number of lithic tools or groundstone implements recovered was remarkably low (n=64), even for a Mississippi River Valley site. Therefore, the orientation of the research focused on those attributes of the collection which might enable interpretations as to site's function (or functions) and the possible cultural interaction spheres represented during the various occupations. The attributes included identification of the lithic source material; identification of the reduction stage within which the particular item fit; and various length, width and weight measurements.

The interpretations of the lithic assemblage involved the application of the economic principles of "least cost," "minimization of effort" and "efficiency" (Earle and Christenson 1980; Earle and Ericson 1977). Through the use of these concepts, it was hoped that questions relevant to lithic technology; social and political structure; and raw material use could be addressed.

Technology

In 1979, Goodyear proposed that the distinctive Paleo Indian tool assemblage of the eastern United State represented a "carrying technology." He suggested that specific elements within the assemblages were the result of adaptive technological innovations aimed at dealing with situations in which a scarcity, or lack of lithic resources prevailed for certain periods of time.

> "If the problem of geographic incongruities can be solved through portable technologies, the problem of situational contingencies can be alleviated through flexible technologies. Flexibility also means the capability for redesigning tools as other tools and otherwise re-casting the raw material of the tool type into wholly new tools and cores for the derivation of tools if necessary" (Goodyear 1979:9).

Conservation of available lithic raw materials through technological innovation was also addressed by Goodyear. The thermal alteration of some lithic materials results in an increase in the ease of flake removals. Initiation of this strategy would have reduced the potential for wasting of the raw material through undesired stress breakage.

If Goodyear's model has applicability to other time periods, and for other assemblages, then two questions could be addressed by the 3CT50 lithic assemblage. These are:

1. Does the collection as a whole, or elements within the collection, evidence re-use of materials or tools?

2. Is there any evidence of thermal alteration to the materials which might support an argument for conservation of resources?

Another aspect of the lithic technology involved the actual identification, if possible, of the lithic procurement strategies utilized by the Little Cypress Bayou inhabitants. The technologies involved in the actual extraction of the lithic raw materials from their geological matrix were not considered. We did want to determine, however, by using the ethnographic literature whether or not there was any evidence to support the prehistoric transport of bulk raw materials from source areas to sites of consumption and use. Toward this end, research question 3 was formulated:

3. Do the results of excavations at contemporaneous sites indicate difference in the types of lithic materials from those recovered at 3CT50 and is there any evidence to support sites' functioning as lithic reduction stations or distributive stations in the central Mississippi River Valley?

Social and Political Structure

The implications of question 3 are relatively far-reaching. The concept of long distance trade or procurement strategies naturally involves a consideration of the effects of such strategies on the participants. In order to understand the processes that account for the exploitation, distribution and utilization of resources, it is necessary to understand the concurrent social, and political development that is so closely interrelated with exchange or trade networks (Morris 1978). Ethnography has demonstrated that exchange is not merely a component of the mechanics of subsistence subsystems, but also "spans the [social] distance between interacting parties; the form of the transaction clarifies the meaning of that distance" (Wilmsen 1972:1). This method of social interaction occurs at all levels of society, house-hold to house-hold, village to village, region to region.

Exchange may also be hierarchal, or stratified within a single society, as with differential access to goods and services, through rank and status (Pires-Feneria and Flannery 1976). As such, exchange may be considered a coherent and essential part of internal, as well as external social, political, and sometimes religious subsystems. Wright (1972) emphasizes the role of exchange in the development and change of these subsystems. Thus, models of exchange that transcend archaeologically defined periods and cultural space, are more suited to demonstrating explanations of that exchange within the overall context of systematic cultural development (Hill:1977).

Lithic artifacts and the materials from which they were derived, provide an excellent data base for studies of the sort outlined above. This is because, as has been previously pointed out (Goodyear 1979), lithic resources are geographically discrete and relatively resistant to decay. This renders them to be highly predictable variables. These resources were utilized during the entire range of the prehistoric occupation of northeast Arkansas. Patterned changes in their utilization and exploitation, that occurred concurrent with changes in the aspects of these cultures make them ideal indicators of these changes.

Therefore, the resolution of question 3 and questions 4 through 6 (presented in the next subsection) could logically be expected to address the type of social and political organizations which might have been in operation during the various occupations at the site. If, for example, it was determined that little in the way of lithic materials from sources at some distance from the site were utilized, an argument could be made that the site ranked relatively low within the social or political hierarchy. Obversely, if a wide-range of lithic types were present, then perhaps the site ranked high. Whichever the case, by evaluating the lithic assemblage from the perspective of rank and status an impression of tne site's function or functions could be gained.

Implications of Raw Material Use and Lithic Types

The northeast Arkansas Lowlands offer a unique setting for lithic studies because of the spatial incongruities that exist between where sites containing lithic artifacts are found and where the sources of these lithic raw materials are located. An attempt to define the processes by which these raw materials were procured, transported and utilized formed the basis for the final three lithic specific questions which were addressed during the lithic analysis.

Two areas where material values are hypothesized to have grossly affected lithic artifact patterning at sites in northeast Arkansas include transportation and utilization. With regard to transportation, the importation of lithic raw materials may have involved technologies and innovations aimed at reducing the labor cost of removing this resource to the consumer. Utilization of lithic raw material would have been governed by methods and technologies aimed at the conservation of a scarce resource that was commensurable with its value; and, conservation is expected to have taken the form of variable efficiency in the utilization of lithic resources. In short, the acquisition cost of a given unit of raw material should influence how efficiently that raw material was utilized.

In order to address such issues it was necessary to consider three questions:

4. What are the various raw material types likely to be exploited by the 3CT50 inhabitants or to have been utilized by them.

5. By considering a lithic reduction model (Dicks 1984), is it possible to determine if lithic manufacture or merely lithic maintenance is being conducted during the occupations of the site.

6. If least-cost strategies are being hypothesized, then what lithic evidence supports the application of such a principle.

In conclusion, then, the lithic analysis was directed toward the identification of raw material types and the determination of the range of uses to which specific materials might have been put.

Research Methods

All lithic artifacts were placed into recognized classes based on inferred artifact function. In total, six classes were recognized: Class I, Bifacial Tools; Class II, Unifacial Tools; Class III, Cores; Class IV, Groundstone Implements; Class V, Marginally Retouched Flake Tools,; and Class VI, Flake Debitage. Within each class, categories based on morphology, technological attributes and function were also defined. In the case of projectile points, this functional category is divided into sub-categories whose significance is also stylistic and possibly historically relevant. Within each of these classes and categories observations on raw material used, and basic measurements were made for each artifact.

In addition to the chipped stone tools, cores and flakes, and groundstone, fire-cracked rock (FCR) was also recovered from numerous units. All FCR was sorted and the total weighed.

Lithic Results

In total, 2695 chipped or groundstone artifacts were recovered during the course of the 3CT50 investigations. Subsumed under the various classes, these artifacts included bifacial and unifacial tools, cores, and groundstone; the majority however were flakes or debitage. Each of the classes and categories are discussed in detail below. Table X-5 presents a summary of artifact classes I through V. Flake summaries are presented later during the Class VI discussion.

Class I: Bifaces

Thirty-eight lithics were classified into seven separate categories of bifacial tools and bifacial tool fragments. The categories are based on the inferred function and morphological attributes of the tools and fragments; included are projectile points, preforms, drill fragments, miscellaneous fragments, modified fragments, adzes, and scrapers. Projectile points were divided further into sub-categories that reflect spatial and temporally defined morphological types that are cultural-historically significant. Biface fragments were also subdivided into sub-categories based upon what portion of the biface they represented. These include distal tip fragments, mid-sections, proximal portions and unidentified fragments.

Category 1: Projectile Points: A total of twelve artifacts are included in this category. Projectile points, as a class, are highly formalized tools that seem more likely to exhibit stylistic changes than other lithic categories. These stylistic changes may be related to: 1) tool function requirements; 2) inherent properties of the raw material on which they are made; or 3) individual and cultural preferences for form. Regardless of the reason(s), as is well-known, different projectile point forms are often diagnostic of specific time periods and cultures. They are, therefore, useful not only to what their inferred function(s) imply about cultural behaviors, but also as chronological and/or cultural hallmarks.

Each of the projectile point sub-categories are described using standard nomenclature outlined in Cambron and Hulse (1975). Individual artifacts were inspected under a binocular microscope at 10x, 30x and 50x magnification. Wear pattern nomenclature is derived principally from Ahler (1979), with ancillary data from sources in Hayden (1979).

The projectile point category is divided into 12 sub-categories based on differences in morphology. These morphological differences have been equated with established projectile point types when possible.

TABLE X-5. LITHIC TOOLS AND GROUNDSTONE RECOVERED FROM 3CT50.
(Page 1 of 2)

PROVENIENCE	LITHIC CLASS	CATEGORY	DESCRIPTION
Controlled Surface Collection			
N150E270	III	1	Amorphous core
N150E285	V	-	Marginally retouched flake tool
N152E273	IV	8	Miscellaneous groundstone fragment
N155E310	III	1	Amorphous cores (2)
N160E280	I	6a	Thin biface fragment
N160E290	I	6b	Thick biface fragment
N160E300	I	6a	Thin biface fragemnt
N165E270	III	1	Amorphous core
N165E280	I	6a	Thin biface fragment
N165E295	I	6a	Thin biface fragment
N165E305	V	-	Marginally retouched flake tool
N165E310	I	6a	Thin biface fragment
N170E275	V	-	Marginally retouched flake tool
N170E280	I	1g	Projectile point
	III	1	Amorphous core
N175E283	IV	3	Pitted cobble
N175E300	I	1a	Projectile point
N175E305	III	1	Amorphous core
N180E300	IV	5	Concave abrader
N180E315	I	6a	Thin biface fragment
N185E300	III	1	Amorphous core
N185E305	I	1c	Projectile point
N185E310	V	-	Marginally retouched flake tool
N225E349	I	1j	Project point
Test Pits			
TP 4, L4	III	1	Amorphous core
TP 4, L7	I	6a	Thin biface fragment
TP 6, L6	III	1	Amorphous core
TP 7, L6/7	III	1	Amorphous core
TP10, L1	III	1	Amorphous core
TP12, L2	IV	7	Rounded abrader
	V	-	Marginally retouched flake
TP12, L3	I	6c	Unidentified biface fragment
TP16, L2	V	-	Marginally retouched flake
TP19, L4	I	6a	Thin biface fragment
	V	-	Marginally retouched flake
TP19, L5	III	1	Amorphous core
TP20, L6	I	6c	Unidentified biface fragment
	IV	5	Flat abrader
	V	-	Marginally retouched flake
TP20, L7	IV	5	Flat abrader
TP21, Gen.	IV	8	Miscellaneous groundstone fragment
TP22, L4	I	6a	Thin biface fragment
	I	6c	Unidentified biface fragment
	IV	5	Flat abrader

TABLE X-5. LITHIC TOOLS AND GROUNDSTONE RECOVERED FROM 3CT50.
(Page 2 of 2)

PROVENIENCE	LITHIC CLASS	CATEGORY	DESCRIPTION
Test Pits Cont'd			
TP22, L5	V	-	Marginally retouched flake
TP23, L7	I	6c	Unidentified biface fragments (2)
TP26, L6	V	-	Marginally retouched flake
TP26, L7A	IV	1	Celt fragment
TP27, Ip	III	1	Amorphous core
TP27, L2	IV	8	Miscellaneous groundstone fragment
TP28, L2	IV	9	Miscellaneous battered fragment
Features			
30	II	2	Small unif. thumb-nail scraper
	IV	8	Miscellaneous groundstone fragment
90	I	5	Bifacial drill fragment
102	IV	2	Hammerstone
114	V	-	Marginally retouched flake tool
161	V	-	Marginally retouched flake tool
173	I	6c	Unidentified biface fragment
254	I	1b	Projectile point
256	V	-	Marginally retouched flake tool
257	IV	6	Concave abrader
295	IV	5	Flat abrader
	IV	6	Concave abrader
313	III	1	Amorphous core
324	III	2	Bipolar core
351	I	3	Adze fragment
403	III	2	Bipolar core
413	I	6b	Thick biface fragment
419	IV	5	Flat abrader
625	I	1h	Projectile point
	I	2	Bifacial preform
	I	6a	Thin biface fragment
	III	1	Amorphous core
	III	2	Bifacial core
650	IV	3	Pitted cobble
654	I	6b	Thick biface fragment
656	III	2	Bipolar cores (2)
672	V	-	Marginally retouched flake tool
730	I	1i	Projectile point
745	III	1	Amorphous core
	V	-	Marginally retouched flake tool
747	V	-	Marginally retouched flake tool
769	IV	4	Polished pebble
	IV	5	Flat abrader
775	I	6a	Thin biface fragment
803	IV	3	Pitted cobble
841	I	4	Bifacial scraper
1001	I	6c	Unidentified biface fragments (2)
	IV	4	Pollished pebble

<u>Category 1a (N175E300; Figure X-3)</u>: The single specimen that comprises this sub-category is well made and possess a thin, biconvex to somewhat flattened cross-section. The medial ridge is almost completely removed by shallow flake scars that frequently extend across one entire face resulting in the flattened cross-section. Blade edges are symmetrically excurvate, and converge to form a broad tip. The lateral blade edges are formed by fine, shallow pressure flake removals. The proximal haft of this artifact is formed by moderately deep corner notches that produce short, rounded barbs; a wide, expanded stem; and a rounded, or excurvate base.

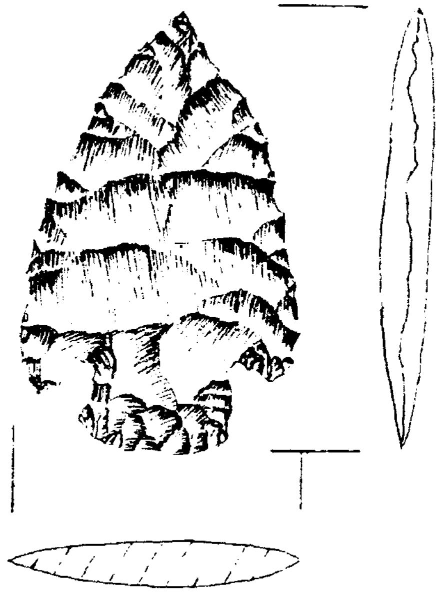

FIGURE X-3. CATEGORY 1a PROJECTILE POINT.

Wear on this specimen is variable. Use wear is restricted primarily to the distal end and does not extend proximally more than 15 mm to 20 mm on the lateral blade margins. This wear is a combination of blunting and grinding that exhibits a fine textural gloss under 10x binocular magnification. Blunting and sporadic polishing also occurs in the vicinity of the distal tip on flake arris (apex of flake ridge). The majority of the lateral blade edges and margins exhibit no pronounced wear except for occasional stepped fracturing that is probably related to manufacturing. In the area of the proximal haft, rounding or blunting of flake arris is extensive and this wear is probably related to minute abrasion of the tool surfaces with hafting elements. Some of the ridge-wear approximates fine polishing; this would be expected if abrasion resulted from extended contact with leather bindings and/or wood shafts.

The point is manufactured from a fine quality, non-fossiliferous gray chert. The chert may have been obtained from secondary lag deposits on Crowley's Ridge, but might have originated in the Boone formation in the Ozark Escarpment.

Measurements: Length = 57 mm; width = 34 mm; thickness = 5 mm; edge angle = 25°

Comments: This specimen is very similar to a number of corner-notched, broad, and excurvate-bladed projectile points. These include established types such as Snyder, St. Charles, Williams and Marshall, all of which tend to cluster in the Late Archaic to Early Woodland periods in the Mississippi Valley. Category 1a more closely approximates the Big Creek point type described by Morse (1970:22) and Morse and Morse (1983:118). According to Perino (1971:10), the Big Creek point association with the Late Archaic period is well established. Morse and Morse (1983) associate this projectile point with a Late Archaic date of between 3000 B.C. to 2000 B.C. in the Central Mississippi Valley.

The profusion of blunting centered around the distal end of the Category 1a specimen suggests that it was used to work a relatively durable but soft material such as leather or bone, and the distal wear also suggests a perforating function. The absence of wear on the blade edges indicates that this was not a scraping or cutting tool.

Category 1b (Feature 254; Figure X-4): Only one specimen was included in this category. It is characterized by a thick, rhomboid to biconvex cross section and a slightly asymmetrical blade shape. One blade edge is incurvate, while the opposing blade edge is straight to slightly excurvate. The incurvate blade margin is characterized by a steep, beveled retouch that also occurs on the opposite blade margin but is not nearly as pronounced. This beveling of the blade edges is the result of steep retouch that has undoubtedly reduced the blade's width and created the concave outline of one blade edge. The distal tip is moderately rounded while the extreme proximal portion or base has been broken off by a lateral fracture. Wide, shallow corner notches are present that create short barbs and a stem that tapers toward the missing base.

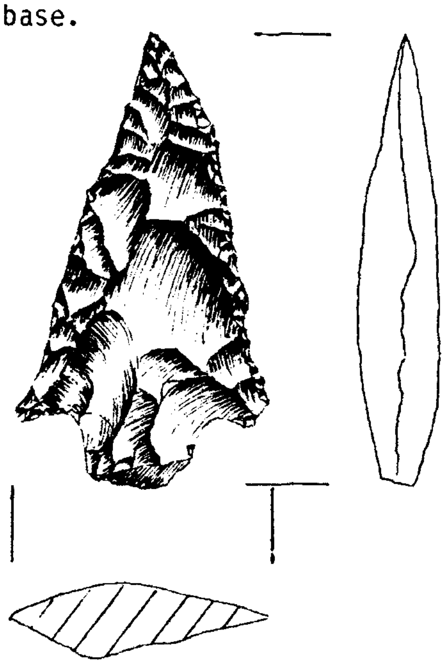

FIGURE X-4. CATEGORY 1b PROJECTILE POINT.

Steeped and scalar scarring is evident along the entire length of the blade edges. Polishing and some glossing also occurs on flake arris adjacent to the blade margins. No comparable wear occurs on or near the distal tip.

The raw material on which this artifact was manufactured is a mottled blue gray and light tan chert that is probably derived from the Burlington formation in eastern and central Missouri.

Measurements: Length = 59 mm; width = 35 mm; thickness = 12 mm; edge angle = 35°-40°.

Comments: The distinctive beveled edges of this specimen first appear in Dalton assemblages; however, the bevelled edge continues to be found on later Early Archaic projectile point types such as Hardin. The incurvate blade edge is probably a result of edge rejuvenation that produced the beveled morphology and rhomboidal cross-section. The absence of a complete base and stem on this artifact makes it difficult to classify with an established type. The blade morphology, however, very strongly suggests an affinity with a series of Early Archaic corner notched and beveled projectile points.

Wear on this specimen suggests a cutting function of both hard and soft materials. The direction of scalar and stepped fracture scars suggests a sawing action.

Category 1c (N185E305; Figure X-5): The specimen in this category is very similar to projectile point Category 1a. It is a broad, short point that exhibits moderately prominent barbs and a wide, expanding stem. These features are formed by broad and deep corner notches. The blade shape is slightly excurvate, and in cross-section this point is biconvex. The haft is expanded and possesses a convex base. The distal extremity has been hinged off and a proximally oriented, longitudinal flake scar extends from this fracture halfway from the face on one side. This appears to be an impact fracture resulting from a percussion blow to the distal end upon contact with a hard surface.

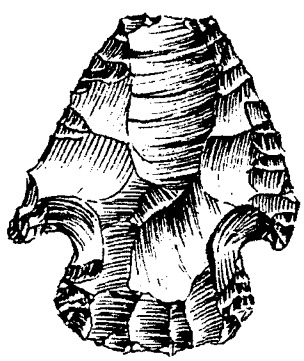

FIGURE X-5. CATEGORY 1c PROJECTILE POINT.

Wear is readily observable at 10x magnification on both lateral blade edges. The wear consists of a combination of pronounced blunting of the working edge accompanied by subsequent rounding of this edge and adjacent flake arris.

The raw material is a grayish-brown chert of fine quality and grain that may be derived from the Dover formations in north-central Tennessee.

Measurements: Length = 45 mm; width = 39 mm; thickness = 6 mm; edge angle = 25°-30°.

Comments: Category 1c is fairly representative of the Big Creek point type first described by Morse (1970). In this respect it is very similar to Category 1a, and these two may actually represent a single type though there are some obvious morphological differences between them. Big Creek points are common in the Central Mississippi Valley and adjacent regions. Morse and Morse (1983) suggests that they are diagnostic of an early Late Archaic phase.

Wear patterns on this artifact suggests a combination of activities associated with the cutting and sawing of relatively soft but durable materials. The tenuous identification of an impact fracture also suggests that this artifact functioned as a projectile tip.

Category 1d (Area A; Figure X-6): The fragmentary specimen that comprises Category 1d includes a complete base and blade midsection. The distal portion and part of the blade are missing and were truncated off by a lateral snap. The haft includes broad, shallow notches that form an expanded stem with a straight to slightly convex base. In cross-section this artifact is biconvex. One interesting aspect of this specimen is that the blade is set at an angle 15° off a line drawn through the center of the stem (Figure X-6).

FIGURE X-6. CATEGORY 1d PROJECTILE POINT.

Except for some minor step fracturing that is probably related to manufacturing techniques, wear on the fragmented blade portion is lacking. The longitudinal fracture that severed the distal portion

from the proximal portion does not appear to be related to stress exerted through use of this artifact, but is instead the result of fracturing from post-manufacturing thermal alteration. The raw material on which the artifact is made is Lafayette chert.

Measurements: Length = 32 mm; width = 31 mm; thickness = 11 mm; edge angle = 25°.

Comments: This category is similar to the Steuben (Zebree) point type defined by Morse (1963). Its typological position is explained by Perino (1968:194):

> The Steuben point is one of a family of expanded-base point types representing late Middle Woodland-early Late Woodland groups in the mid-eastern United States.

Category 1e (Area A; Figure X-7): The single specimen in this category is a triangular stemmed point. It possesses straight to slightly incurvate blade edges that taper to an acute distal tip. The shoulders are tapered and contract to a prominent point stem. In cross-section this artifact has acute medial ridges but is basically biconvex.

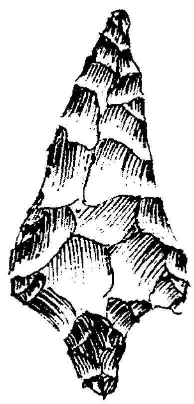

FIGURE X-7. CATEGORY 1e PROJECTILE POINT.

Wear is predominantly absent on the blade edges except near the tip, where there is pronounced scalar scarring and stepped fracturing. Some rounding or blunting of flake ridges occurs as well. The raw material is black Pitkins chert.

Measurements: Length = 52 mm; width = 25 mm; thickness = 11 mm; edge angle = 40°-35°.

Comments: This specimen is equatible with the Gary point type which is very widespread throughout the Central Mississippi Valley and adjacent regions to the east and west. Morse and Morse (1983:117) indicate a Late Archaic date for this type, and its occurrence at such sites as Poverty Point in Louisiana seems to confirm this.

Category 1f (General surface, west of Little Cypress Bayou; Figure X-8): The single specimen in this category is a nearly complete corner-notched projectile point. The blade is roughly triangular and is characterized by an acute distal end and straight blade edges. The blade edges are very lightly serrated by fine pressure retouch. Shallow corner-notches are present on the haft portion and although the base has been partially damaged, it appears to have originally been expanded and convex. In cross-section, the point is biconvex.

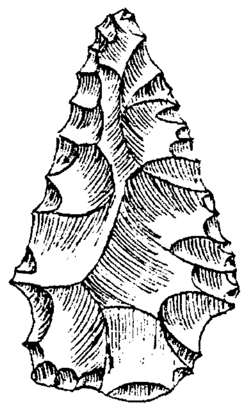

FIGURE X-8. CATEGORY 1f PROJECTILE POINT.

Step fracturing is extensive on the blade margins and near the distal end. The smoothing and grinding of the distal end and flake arris present suggests that this specimen was used as a gouge in working soft materials such as wood. The raw material on which this artifact was fabricated is white novaculite.

Measurements: Length = 55 mm; width = 32 mm; thickness = 7mm; edge angle = 20°.

Comments: With the exception of the presence of light serrations on the blade margins of this artifact, it is very similar to the Big Creek point type established by Morse (1970). Category If may simply be a variant of this type, and as such would be similar to Categories 1a and 1c. The Big Creek point is a relatively common type on Late Archaic sites in the Central Mississippi Valley (Morse and Morse 1983).

Category 1g (N175E280; Figure X-9): Category 1g is an incomplete projectile point specimen from which the base has been removed by lateral truncation. The blade shape is roughly triangular, although blade margins are asymmetrical with one side slightly convex and the opposite side, convex. Light irregular serrations are present on the blade margins. Large shallow side notches form slight barbs, one of which has been fractured off. The incomplete stem tapers inward and may have terminated with a rounded base. The cross-section is somewhat flattened.

FIGURE X-9. CATEGORY 1g PROJECTILE POINT.

Wear on this specimen seems to be of two types, possibly representing separate and sequential functions. Serrated projections on the blade margins are sheared off almost level with flake indentions. Some crushing is evident in the areas around the broken serrations, and this is predominantly directional, in line with, or paralleling the blade margins. This wear morphology strongly suggests a sawing function, possibly of a relatively hard material such as antler or bone. Around the distal extremity, all flake arris have been substantially smoothed over and polished. The result is a glossy light refraction similar to the wear pattern observed on the Category 1f specimen. This polishing has smoothed and worn earlier crushing and shearing of the blade serrations and it would appear that the Category 1g specimen was first employed as a sawing, or cutting implement, and then possibly as a gouge in working a softer material.

The raw material from which this artifact was made is interesting. The chert resembles samples obtained from and in proximity to Dover, in middle Tennessee; commonly referred to as Dover chert, the source area is over 75 mi east of the site.

Measurements: Length = 55 mm; width = 35 mm; thickness = 9 mm; edge angle = 30°-35°.

Comments: Because the basal portion is incomplete, this particular specimen is difficult to associate with any established type. Based on the treatment of the blade, combined with the trait of corner-notching, as well as the size of this specimen, it is almost certainly of Archaic origin. Its morphological similarity to several Late Archaic points in the 3CT50 collection, such as Categories 1b, 1c and 1f may suggest a Late Archaic association.

Category 1h (Feature 625; Figure X-10): This artifact is the almost complete half of a projectile point which was longitudinally

FIGURE X-10. CATEGORY 1h PROJECTILE POINT.

split down the middle. The cause of this somewhat peculiar fracture morphology is unclear although it may have resultec from forceful impact with a hard object.

The present half allows for a reconstruction of the once-complete configuration. The blade portion is triangular and probably symmetrical with straight to slightly concave blade edges. Deep corner notches have produced distinct and prominent barbs and an expanded stem with a rounded base. In cross-section, the specimen is biconvex. Wear was not observed on that portion of the blade that was present.

Measurements: Length = 48mm; thickness = 9mm; edge angle = 20°.

Comments: Although incomplete, Category 1h appears to be another variant of the early Late Archaic Big Creek point type (Morse 1970).

Category 1i (Feature 730; Figure X-11): This spike-like projectile point has an elongated triangular blade with a fractured distal end. The shoulders are only slightly pronounced and the stem tapers inward to a rounded base. One shoulder is more prominent than the other, but both are relatively indistinct. In cross-section, the point is biconvex.

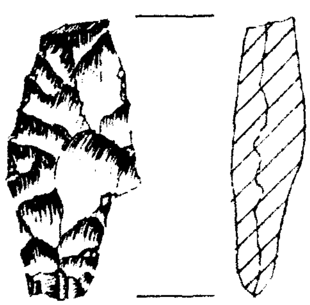

FIGURE X-11. CATEGORY 1i PROJECTILE POINT.

Although extensive wear was not observed on the portion of the blade that remains, the stem exhibits light polishing on the edge margins and on flake arris. This type of wear may result from prolonged friction with a wooden cane or antler socket and leather bindings. The extensive development of this wear pattern suggests that this artifact served other or additional functions than just as a projectile point tip.

Measurements: Width = 19mm; thickness = 10 mm; edge angle = 34°-40°.

Comments: This rather indistinct specimen resembles several spike-like projectile points with distribution east of the Mississippi River Valley. These include the Bradley Spike, Flint River Spike, and the Tombigbee Stemmed (Cambron and Hulse 1975). All of these are generally found in Woodland contexts and, in the Southeast, are frequently associated with local Middle Woodland Hopewell cultures (Faulkner and McCollough 1973).

Category 1j (N225E349; Figure X-12): This highly fragmentary specimen consists only of a base and a small portion of the lower blade. The stem is formed by large, shallow side notches which give it an expanded appearance. The base is incurvate and, overall, this specimen is crudely made.

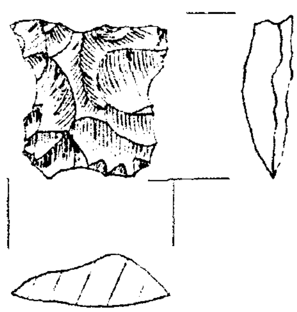

FIGURE X-12. CATEGORY 1j PROJECTILE POINT.

The specimen has been heavily marred by potlid fractures from post-manufacturing thermal alteration. Wear could therefore not be identified on any part of the fragment. Likewise, the fragmentary nature of this specimen precluded any measurements except width, which is 7 mm. The point was manufactured of a low quality Lafayette chert.

Comments: The expanded stem and shallow side notching on this specimen suggests a morphological affinity to the Steuben (Zebree) point type, defined by Morse in Illinois (Morse 1963) and subsequently recognized in northeast Arkansas (Morse and Morse 1980, 1983). Its temporal association is probably Middle to Late Woodland.

Category 1k (General Surface; Figure X-13): The single artifact that comprises this category consists of only the basal portion of a small triangular point. Hafting elements, such as notching or a protruding stem, are absent. Instead this fragment tapers from a wide base directly to the distal tip (missing on this specimen) and is uninterrupted by shoulders or notches. The base is convex, and exhibits on small amounts of polishing, probaoly resulting from abrasion with hafting elements. In cross-section, it is flattened and extremely thin.

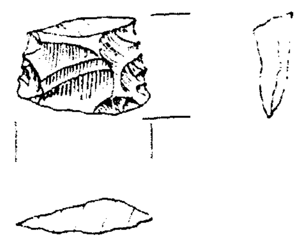

FIGURE X-13. CATEGORY 1k PROJECTILE POINT.

Measurements: Width = 17 mm; thickness = 4mm; edge angle = 15°

Comments: This fragmentary specimen is similar to a number of small triangular point types such as the Madison point (Cambron and Hulse 1975; Morse and Morse 1983). It, and other similar forms, appear in the southeastern United States after A.D. 800, and coincide with the introduction of the bow and arrow (Brain 1971). In northeast Arkansas, the Madison point is associated with the Mississippian period (Morse and Morse 1983:272).

Category 1l (General Surface; Figure X-14): This is a large, fragmentary specimen consisting of the point stem and shoulders. The blade and distal portions have been fractured off. Although incomplete, the blade appears to have been very broad and in excess of 40 mm in length. Shoulders are sharp and taper to an elongated, contracted stem. The base is convex and rounded. In its completed form, this artifact would probably have been fairly large and heavy. In cross-section, it is biconvex. It is made on Jefferson City dolomite.

Measurements: thickness = 11 mm.

Comments: Although much longer, this projectile point is similar in appearance to Category 1e and it may represent a larger or unfinished version of the Late Archaic Gary point.

A projectile point with similar base and stem morphology is illustrated by Morse and Morse (1983:188, Figure 9.4.e.). They suggests a Baytown association for this type.

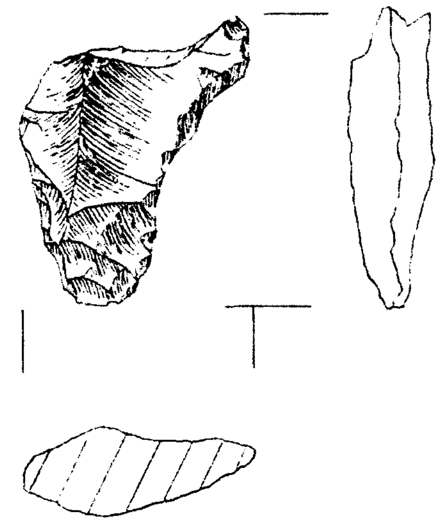

FIGURE X-14. CATEGORY 11 PROJECTILE POINT.

Category 2: Bifacial Preform (Feature 625; Figure X-15a): The single specimen in this category is a rounded, triangular biface that appears to have been a preform intended for further modification, possibly into a projectile point. Flake removals and shaping were primarily achieved by percussion, although limited pressure retouching is evident on the margins. It appears to represent an advanced stage of finishing, or reduction; however, finalization, in the form of preparation of the haft, was not achieved. The distal point is also blunt, rather than acute as might be expected to occur on a finished implement.

Measurements: Width = 30 mm; length = 47mm; thickness = 11mm; edge angle = 30°.

Comments: The Category 2 artifact is one of a group of lithic artifacts that were all deposited in a shallow pit (Feature 625) presumably to be retrieved and utilized at some later time. The raw material is Everton chert which is abundant in the upper White River Valley where it erodes from the eastern Ozarks, Middle Ordovician Everton Formation (Dicks 1983). It is conceivable that acquisition of this raw material included its conversion into a light, easily transported form that was to be modified later into a finished lithic implement. Category 2 appears to represent this form. Off-site initial reduction is supported by the absence of percussion flakes of Everton chert in the 3CT50 debitage assemblage.

Category 3: Adze Fragment (Feature 351; Figure X-15b): This artifact appears to be the proximal, or butt portion of a bifacial adze. It is very similar to adze butts described and illustrated by Morse and Goodyear (1973) and Goodyear (1974) for Early Archaic Dalton

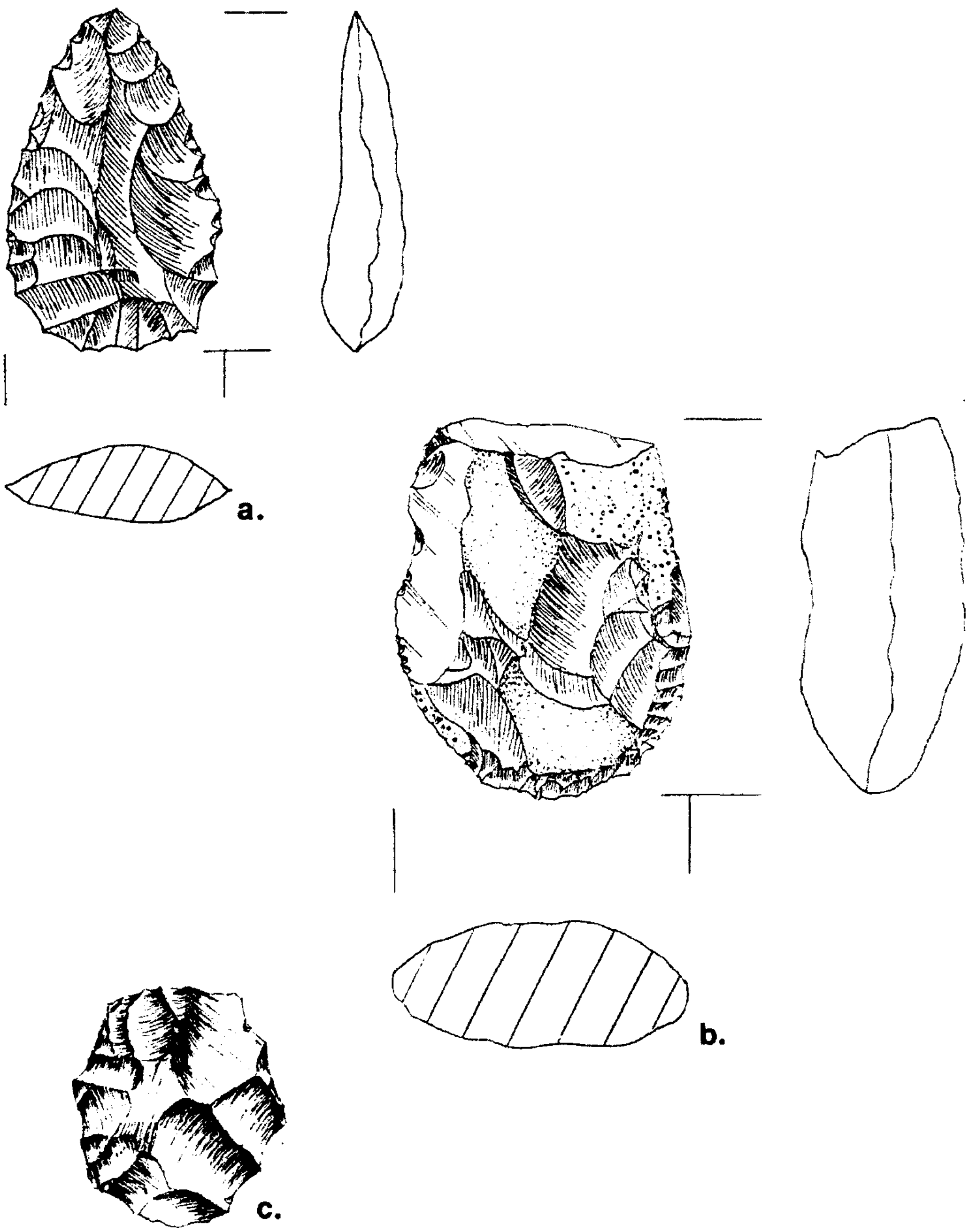

FIGURE X-15. BIFACIAL TOOLS.

a) Biface Preform, Feature 625
b) Adze fragment, Feature 351
c) Bifacial scraper, Feature 841

assemblages found in the Central Mississippi Valley. This fragment is a thick, rounded proximal portion which has been severed from the distal working edge. Wear consists of heavy polishing on the butt which is probably the result of friction, or abrasion against the handle socket into which the adze was inserted (Goodyear 1974). It is made on Lafayette chert, and may have been recycled, after initial breakage, into a spokeshave or scraper.

Measurements: Width = 43 mm; thickness = 21mm.

Comments: Although the wear patterns and basic shape morphology displayed by the Category 3 specimen are similar to those ob- .ed by Morse and Goodyear (1973) on adzes associated with Dalton assemblages, this artifact is more poorly made. Adzes first appear in northeast Arkansas during the Dalton phase (Morse and Goodyear 1973), however they are commonly associated with later periods as well. Given the more recent geomorphological setting of the Little Cypress Bayou site, it is likely that the Category 3 adze butt is associated with a later period.

Category 4: Bifacial Scraper (Feature 841; see Figure 15c): This is a small oval biface made on a thin flake of thermally treated chert. With the exception of the intact striking platform, the biface exhibits irregular pressure and percussion retouch around the flake margins. No evidence of modification for hafting was observed and it therefore seems probable that this artifact was hand-held. Wear includes both crushing and stepped fracturing, but is predominantly polishing which suggests that the biface was used in working soft, but durable materials.

Measurements: Width = 31 mm; length = 34 mm; thickness = 19 mm; edge angle = 30°.

Category 5: Bifacial Drill Fragment (Feature 90): This fragmentary artifact includes the distal portion and part of the shaft of what may have been a bifacial drill. The shaft was formed by careful, steep pressure retouch with parallel blade margins that converge near the distal end to a sharp, acute point. In cross-section, it is biconvex rather than rhomboid, a shape that is characteristic of frequently encountered, final stage Dalton points (Goodyear 1974). Wear consists of heavy abrading and polishing of the distal tip and of flake arris on the shaft. The raw material is Boone chert.

Measurements: Width = 8 mm; thickness = 4 mm; edge angle = 40°.

Category 6: Miscellaneous Biface Fragments (not illustrated): This category includes the 22 miscellaneous, fragmented bifaces that could not be typed into more specific categories based on inferred function or formal morphological traits (see Table X-5 for proveniences). Included in this category are nine distal ends, seven midsections, and four proximal portions. Also included are two small biface fragments that could not be accurately associated with any

particular portion of the biface body but are probably broken midsections. One of the proximal biface fragments had been recycled into a spokeshave after breakage. Other fragments were probably too small, or broken in such a way as to make it difficult to modify them for secondary usage.

In an effort to refine the Category 6 typology, thickness measurements, where possible, were taken on all bifaces in the lithic artifact assemblage. It is believed that this variable might reflect not only different degrees of finishing but also broad functional differences as well. Twenty-four observations were made which are tabulated along with other bifacial artifact data in Table X-6. Thickness values are graphically presented in Figure X-16.

Figure X-16 suggests a bimodal clustering of biface thickness. Fifteen specimens (62.5 percent) have thicknesses which fall within the 6 mm to 10 mm range. One specimen is below 5 mm, while another specimen has a thickness of 11 mm. The remaining five specimens (20.0 percent) range between 19 mm and 21 mm.

Based on the Table X-6 distribution, Category 6 artifacts were classified as either thin bifaces (Category 6a) or thick bifaces (Category 6b). Category 6 bifaces that were too fragmentary for adequate measurements of thickness to be taken, were classified as unidentified (Category 6c). Thin bifaces are described as those that fall within the 4 mm to 11 mm thickness range, and thick bifaces are those that possess thicknesses above 15 mm. The mean thickness for thin bifaces is 7.8 mm, while thick bifaces cluster at 19.4 mm.

All of the Category 1 (projectile points) specimens on which thickness was measurable fall within the thin biface range. Thick bifaces other than those included in the miscellaneous Category 6 grouping, included the adze butt (Category 3) and the bifacial scraper (Category 4). Based on this rather sparse assemblage, it may be inferred that the attribute of biface thickness has typological significance within the assemblage which may be related to tool function.

Class II: Unifacial Tool Assemblage

Only two unifacial artifacts were identified in the Little Cypress Bayou assemblage. Both have been classified as scrapers and are rather informal in terms of their morphology. They are divided into two separate categories based on differences in size, hafting and general appearances that may be related to differences in function.

Category 1: Large Hafted Unifacial Scraper (Area A; Figure X-17): This specimen is made on a large (58 mm long) pebble of heavily weathered Lafayette chert, that appears also to have been altered by thermal treatment. One end of this pebble has been crudely flaked at a steep angle that intersects with the flat underside of the pebble to create an abrupt working edge. Cortex has been retained on the opposing end of the pebble and two shallow notches occur on the

TABLE X-6. BIFACIAL ARTIFACT ASSEMBLAGE METRIC DATA AND TRAIT LIST.

CATEGORY	DESCRIPTION	LENGTH [mm]	WIDTH [mm]	THICKNESS [mm]	EDGE ANGLE [degree]	WEIGHT [gm]	RAW MATERIAL
1a	projectile point	57.0	34.0	5.0	25	13.5	Lafayette chert
1b	"	59.0	35.0	11.0	35-40	5.0	Burlington chert
1c	"	45.0	39.0	6.0	25	13.8	Dover chert
1d	"	32.0	31.0	11.0	25	12.7	Lafayette chert
1e	"	52.0	25.0	11.0	40-45	12.6	Pitkin chert
1f	"	55.0	32.0	7.0	20	11.5	Novaculite
1g	"	55.0	35.0	9.0	30-35	11.1	Dover chert
1h	"	48.0		9.0	20	5.8	Boone chert
1i	"		19.0	10.0	35-40	6.4	Unidentified
1j	"			7.0		3.2	Lafayette chert
1k	"		17.0	4.0	15	1.2	Lafayette chert
1l	"			11.0		8.2	Jefferson City dolomite
2	preform	47.0	30.0	11.0	30	16.4	Everton chert
3	adz butt		43.0	21.0		68.0	Lafayette chert
4	scraper	34.0	31.0	19.0	30	9.7	Lafayette chert
5	drill fragment		8.0	4.0	40	1.2	Boone chert
6a	thin biface			4.0	25	3.2	Lafayette chert
6a	"			10.0	35	4.4	Lafayette chert
6a	"			8.0		3.6	Lafayette chert
6a	"		27.0	8.0	25	3.4	Burlington chert
6a	"			6.0		1.4	Lafayette chert
6a	"		19.0	7.0	25	1.5	Lafayette chert
6a	"		30.0	7.0	35	4.7	Lafayette chert
6a	"			10.0	30	6.7	Lafayette chert
6a	"		21.0	10.0	25	6.5	Burlington chert
6a	"		23.0	7.0	30	3.8	Lafayette chert
6a	"			10.0	30	8.4	Lafayette chert
6b	thick biface		28.0	19.0	40	8.9	Unidentified chert
6b	"			20.0	30	2.2	Lafayette chert
6b	"		32.0	18.0		9.0	Unidentified chert
6c	unidentified biface					1.8	Lafayette chert
6c	"					1.0	Unidentified
6c	"					0.9	Unidentified
6c	"					1.1	Lafayette chert
6c	"					1.5	Pitkin chert
6c	"					1.4	Unidentified
6c	"					3.5	Boone chert
6c	"					1.1	Lafayette chert

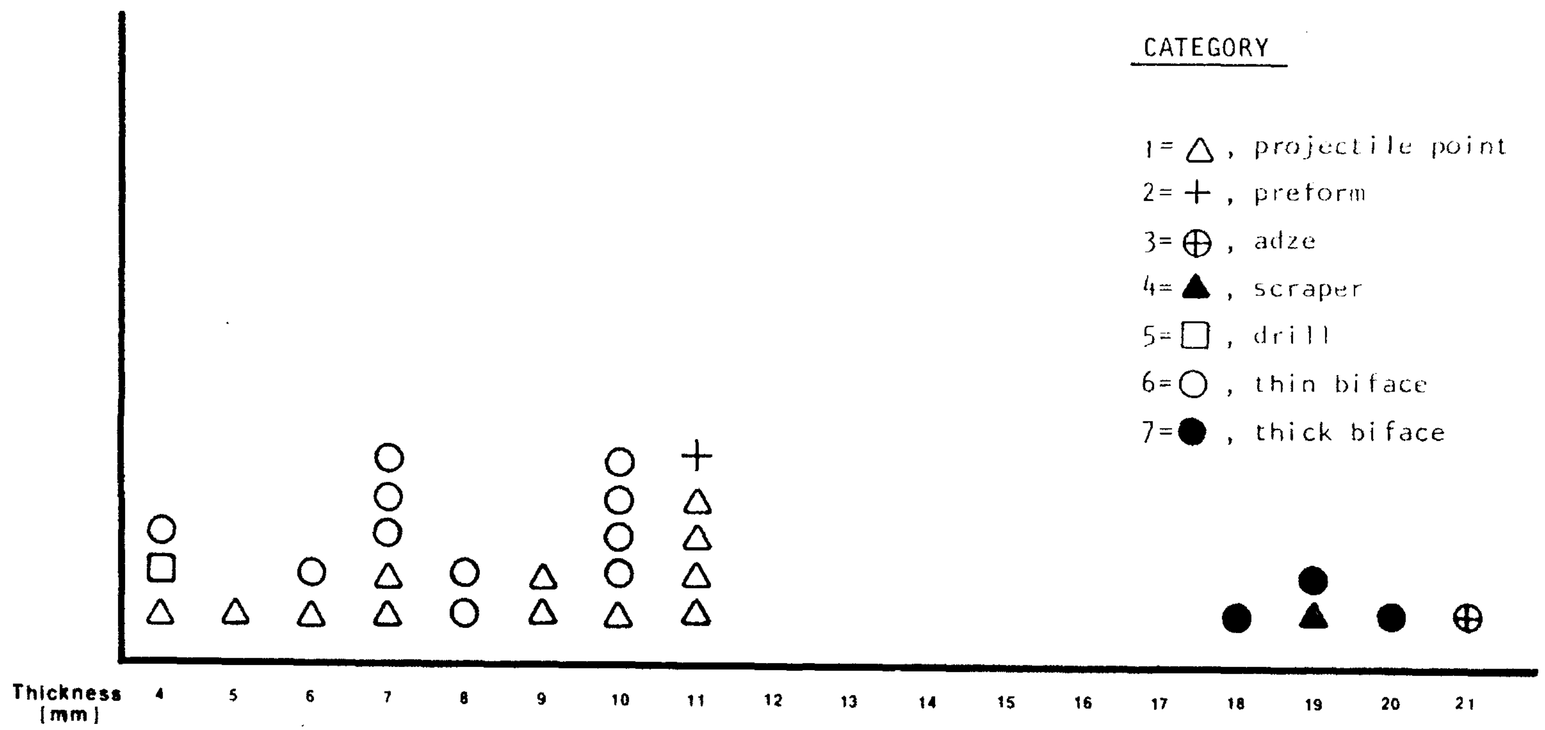

FIGURE X-16. GRAPHIC PLOTTING OF BIFACE THICKNESS.

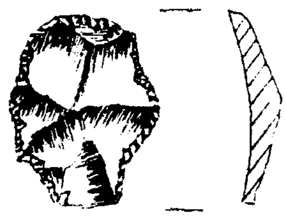

FIGURE X-17. UNIFACIAL TOOL ASSEMBLAGE CATEGORY 1 - LARGE, HAFTED UNIFACIAL SCRAPER.

opposing lateral margins. These notches appear to have facilitated hafting of the uniface. The cortex on the end of the pebble, opposite the working edge, exhibits polishing, probably as a result of abrasion with the hafting elements. Wear on the working edge consists of macroscopic scalar and step polishing, as well as finer, microscopic polishing of flake arris. The underside of this tool exhibits very heavy polishing of the cortex, but this is restricted primarily to that end of the pebble where the working edge is located. Working of a durable, but soft material such as animal hide or even soft wood is suggested.

Measurements: Length = 58.9 mm; width = 40.0 mm; thickness = 17 mm; edge angle = 45°-50°.

<u>Category 2: Small Unifacial Thumbnail Scraper (Feature 30)</u>: This artifact is made on a small interior flake of Lafayette chert that also appears to have been heat treated. Some percussion flaking is evident on the dorsal face of the flake which also exhibits minute, but steep and regular pressure retouch on all margins except the proximal. This portion still retains a wide striking platform. No evidence exists which suggests that this artifact was ever hafted. Heavy smoothing and polishing of the vertical flake arris is evident; this suggests that the tool was used to work relatively soft, non-abrasive materials.

Measurements: Length = 25 mm; width = 19.0 mm; thickness = 50 mm; edge angle - 60°.

<u>Class III: Lithic Cores</u>

Twenty-three cores were identified and classified into two categories: amorphous cores; and bipolar cores. Seventeen specimens (74 percent) were classified as amorphous cores, while only six (26 percent) exhibited evidence of bipolar technology (see Table X-5 for provenience breakdown). Overall, the core assemblage exhibits little regularity, and is uniform only in the sense that individual cores tend to be products of seemingly arbitrary flake detachments. Specific technologies associated with the consistent and regular production of flakes are apparently absent in this assemblage. Likewise, blade cores and evidence for the production of blades is also lacking.

Category 1: Amorphous Cores: The specimens included in this category exhibit no evidence of regularity in flake production or evidence for the employment of a specific technology to facilitate flake detachments. Individual flake scars on these artifacts are usually multi-directional. The scars often seemed to originate on natural cobble facets that served as striking platforms; the latter would have required little modification prior to flake detachment.

All amorphous cores were made on small chert cobbles. The largest cobble measured only 10.5 cm long by 5.5 cm wide. Weights of individual specimens ranged from 210.0 gm to 4.8 gm. Although it is somewhat difficult to judge degrees of core exhaustion, most of the specimens included in this category exhibited numerous flake removal scars. The overall impression is that considerable efficiency was involved in exploiting the raw materials, since few of the cores observed would have been of further use in terms of their potential for additional flake removals. Exceptions were, of course, identified; these specimens may represent instances where the core was discarded, or lost, prior to exhaustion. In Feature 625, a large amorphous core seems to have been "cached" with other lithic artifacts for future use.

Three amorphous cores exhibit evidence of multiple or secondary functions. Two heavy cobbles of Lafayette chert that exhibited large flake scars, also displayed edges that were heavily battered from use as a hammerstone. Although hammerstones are frequently equated with activities related to stone tool manufacturing, such is probably not always the case. The debitage assemblage from Little Cypress Bayou does not suggest manufacturing activities involving extensive hard-hammer percussion techniques, and it is likely that these two specimens were employed in some other task that required pounding, or hammering with heavy, blunt instruments. The third core which exhibits evidence of multiple functions is a small exhausted specimen that has been marginally retouched on one edge. The angle of retouch is relatively steep, between 55° and 60°, which suggests a scraping, as opposed to cutting function (Wilmsen 1970, Goodyear 1974).

Raw materials represented in the amorphous core assemblage tend to reflect the relative availability, as well as value of these individual resources. Thirteen (76 percent) amorphous cores are made on Lafayette chert gravels obtained from Crowleys Ridge. The remaining four specimens are fabricated on cobbles obtained from the Ozark Escarpment. These include Boone chert (one), Jefferson City dolomite (two), and Penter chert (one). All of the Ozark Escarpment lithic cores can be characterized as exhausted specimens; however, several of the Lafayette chert amorphous cores could have been further exploited. This difference may reflect the relative value of the Ozark Escarpment and Crowley's Ridge lithic resources to the inhabitants of 3CT50.

Given the spatial incongruity that exists between 3CT50 and the nearest lithic raw material source, Crowley's Ridge, it is surprising that more efficient modes of flake production are not evident in the

morphology of the core assemblage. Techniques that enable the fabricator to maintain regular, parallel and longitudinal flake removals are more efficient in terms of the number of flake removals possible per unit of lithic raw material, than the arbitrary approach that is evident in the 3CT50 amorphous category of lithic cores. This pattern may, in part, reflect the morphological properties of the raw material itself. Crowley's Ridge gravels tend to be small which would enhance the difficulty of maintaining regular flake removals. This aspect of the lithic core assemblage may also be evidence of specific spatial properties of prehistoric lithic reduction sequences. Flake production may have frequently taken place at, or near the lithic resource area, thereby reducing excess weight and eliminating the need to transport unmodified cobbles to habitation sites located in the lithic resource-free lowlands terrain. The ratio of cores to finished tools and flake debitage seems to support this conclusion.

Category 2: Bipolar Cores: Bipolar cores are produced by a specific technology that often seems to be associated with the production of flakes (specifically pieces esquillees) from small chert pebbles and cobbles (Fitting et al. 1966, Gagliano 1967, Goodyear 1974). Crabtree (1972:42) described bipolar flaking as involving flake production by placing the pebble core on a hard surface, or anvil, and then striking the core with a hard percussion. The result is a "splintering effect" in which a distinctive flake is sheared off the core. Both the cores and the flakes produced by the bipolar technique exhibit distinctive morphology. The proximal end of the core exhibits negative percussion scars (lips) that are normally produced by other techniques as well. The distal end, however, displays crushing and flaking that are the result of contact between the core and the anvil on which it rest (Gagliano 1967, Crabtree 1972, Goodyear 1974).

Goodyear (1973:63) suggests that the bipolar technique was employed exclusively for the production of pieces esquillees at the Brand site. MacDonald (1968), however, believes that bipolar technology is associated with flake production from small pebbles, or cores. He believes that this technique was most frequently utilized in lithic resource-deficient areas where the inhabitants were forced to rely on less desirable lithic resources in the form of small pebbles and gravel.

No pieces esquillees were identified in the 3CT50 lithic assemblage. These artifacts are sometimes difficult to recognize, however, and some may have been missed during the course of analysis. All of the bipolar cores examined, however, were found to occur on small pebbles of Lafayette chert, and given the environmental setting, evidence from 3CT50 would seem to support MacDonald's contention that the bipolar technique was, at least, sometimes employed as a product of necessity.

Class IV: Non-chipped Stone Tool Assemblage

Artifacts classified under this heading are those stone tools that were manufactured, or modified, by grinding, pecking, battering or

polishing, as opposed to chipping. Although a few exceptions (including rhyolite) are present, for the most part the raw materials represented in this assemblage are characterized by a non-microcrystalline structure. As such, these materials, including sandstone and quartz, are not conducive to modification by induced conchoidal fracturing. The macro-crystalline and grandular properties of quartz and sandstone tend to crumble upon impact, and predictable fractures are rarely produced. Although possessing a micro-crystalline structure, the samples of rhyolite observed from 3CT50 exhibited intensive weathering, and the cracks, or fissures, that had developed along relic flow lines rendered it unsuitable for chipping.

In an unweathered form, sandstone is a highly durable and resistant material. Its grandular structure also makes it an ideal abrasive. Rhyolite possess similar qualities and could also have been used as a fine, abrasive tool. Quartzite is one of the harder and most durable materials that the prehistoric inhabitants of the Central Valley could have obtained and utilized.

Artifacts included in the non-chipped stone tool assemblage were classified into nine individual categories based on techniques of manufacture and inferred functional morphology (see Table X-5). These categories are discussed below.

Category 1: Possible Celt Fragment (TP 26, L7A): This artifact is a fragment of finely ground and polished Lafayette chert that includes a small portion of a sharp, convex cutting edge. It is probable that the fragment represents the broken remnants of a groundstone celt. Such artifacts are common in lithic assemblages beginning with the Late Archaic period in northeast Arkansas (Morse and Morse 1983).

Category 2: Hammerstone (Feature 102): This is a large (102.2 gm) weathered cobble of milky quartzite that exhibits multiple battered and crushed facets, apparently resulting from repetitive and forceful contact with another hard material. It likely functioned as a hammerstone, although indirect evidence suggests that it was not employed, at least at 3CT50, in the manufacture of lithic tools. Large, hard hammer produced percussion flakes are virtually absent from the 3CT50 debitage assemblage. It would, therefore, appear that activities related to initial stages of chipped stone tool manufacture which might have employed a large hammerstone, were not carried out on-site.

The battering and crushing observed on the Category 2 specimen may instead be associated with food processing, although no direct evidence exists to support this conjecture.

Category 3: Pitted Cobble (Figure X-18): Three artifacts (recovered from N175E283; Feature 650; and Feature 803) in the lithic assemblage exhibit deep, fabricated pits that appear to have been made by intentional pecking and grinding. Two of these artifacts are made

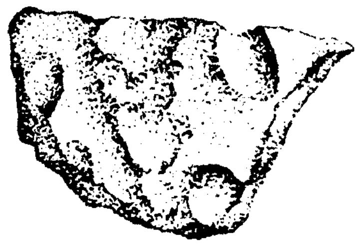

FIGURE X-18. NON-CHIPPED STONE TOOL ASSEMBLAGE
CATEGORY 3 - PITTED COBBLE.

on sandstone cobbles, while the third is on a heavily weathered cobble of Lafayette chert (Feature 650). Goodyear (1974:67) suggested that similar pitted depressions on sandstone cobbles from the Brand site functioned as anvils for the production of pieces esquillees through bipolar percussion. He noted that replication of the bipolar technique produced similar pitted depressions on the surface of sandstone anvils employed in the experiment. Goodyear (1974) and House (1975) also felt that pitted depressions with smooth interior surfaces could have functioned as finger grips to facilitate the handling and use of these tools as hammerstones.

The Lafayette chert specimen included in Category 3, in addition to exhibiting deep pits, also displays extensive battering and crusting of otherwise acute edges. Dodd (1979) suggested that this type of wear could indicate a chopping function where the sharper edges of the battered cobble came in contact with softer material, such as plant fibers, placed on a harder surface or anvil for cutting and mashing.

The pitted depressions observed on all three Category 3 specimens are highly irregular in shape and do not appear to have been placed in such a manner that they would have made good finger grips. Battering and crushing of the exterior surfaces of the sandstone cobbles is absent, which seems to imply that these objects were not utilized as hammerstones with fabricated finger grips. As House (1975:72) suggested, there may be something to the traditional supposition that these artifacts functioned as nutcrackers. Considering the quantity of nut remains preserved in the 3CT50 botanical assemblage, such an inferred function would seem possible.

Category 4: Polished Pebbles: Two highly polished, cortex-covered pebbles of Lafayette chert were identified in the lithic assemblage (from Features 769 and 1001). The polishing is extremely obvious, and does not resemble wear that is normally observed on lag deposit gravels. Normal patination is absent except on the acute edges of these pebbles. It appears to have been obliterated by the intense polishing of the flat pebble surfaces. Both pebbles are small (50 mm to 70 mm in length) but could have been easily hand-held.

Million (1980) and Morse and Morse (1983:141, 225) suggested that polished pebbles found in archaeological contexts probably functioned as pottery-making tools. Million (1980:18-35) notes that polished stones of smooth, water-worn chert or quartzite pebbles are commonly found on Mississippian sites and were often used to burnish marred vessel surfaces. Although a Mississippian occupation is evident at Little Cypress Bayou, no marred surface, shell tempered pottery was observed in the associated assemblage. This does not mean that this surface treatment was not present, as many of the Mississippian sherds examined were in a poor state of preservation due to leaching.

Morse and Morse (1983:141) suggested, however, that polishing of ceramic vessels with smooth pebbles is also a trait that occurs much earlier than the Mississippian period in the Central Valley, and it is more likely that the Category 4 artifacts are associated with the Baytown period occupation.

Category 5: Flat Facetted Abraders: Six artifacts, all of which are fragmentary, exhibited flatly ground facets and were, therefore, placed in this category. As listed on Table X-5, the artifacts were recovered from Test Pit 20, Levels 6 and 7; Test Pit 22, Level 4; and Features 295, 419 and 769. All six flat abraders were made on fine grained sandstone. Morphologically, they are strikingly similar to another set of flat sandstone abraders described by Goodyear (1974) for the Brand site. These are thin (10 mm to 30 mm) plates of fine grained sandstone that are worn on both sides, in some cases to a fine polished finish.

Million (1980:18-35) and Morse and Morse (1983:226) associate sandstone palettes with the preparation of pigments for applying slips to pottery vessels. Even though slipped pottery is apparently absent in the Little Cypress Bayou ceramic artifact assemblage, it is conceivable that mineral based pigments were prepared and utilized in the decoration of other items and materials. Hematite was recovered from the site and this could have been ground into a powdered tempera on the flat sandstone facets. Goodyear (1974:73) alternately suggested a possible association between flat abraders and bone working activities.

Category 6: Concave Facetted Abraders (Figure X-19): Three blocks of fine grained sandstone were identified which exhibit concave or depressed working surfaces that exhibit considerable grinding and polishing. Two of these, although fragmentary, are the largest and the heaviest lithic artifacts in the entire Little Cypress Bayou assemblage, weighing 800.0 gm and 885.0 gm each (from N180E300 and Feature 257, respectively). The third is a smaller fragment (29.6 gm) that was probably originally part of a much larger artifact (recovered from Feature 295). One of the larger sandstone blocks actually has a flat, abraded working edge that is contained within a large depression (Figure X-19), and it may therefore better fit into Category 5 in terms of its functional morphology.

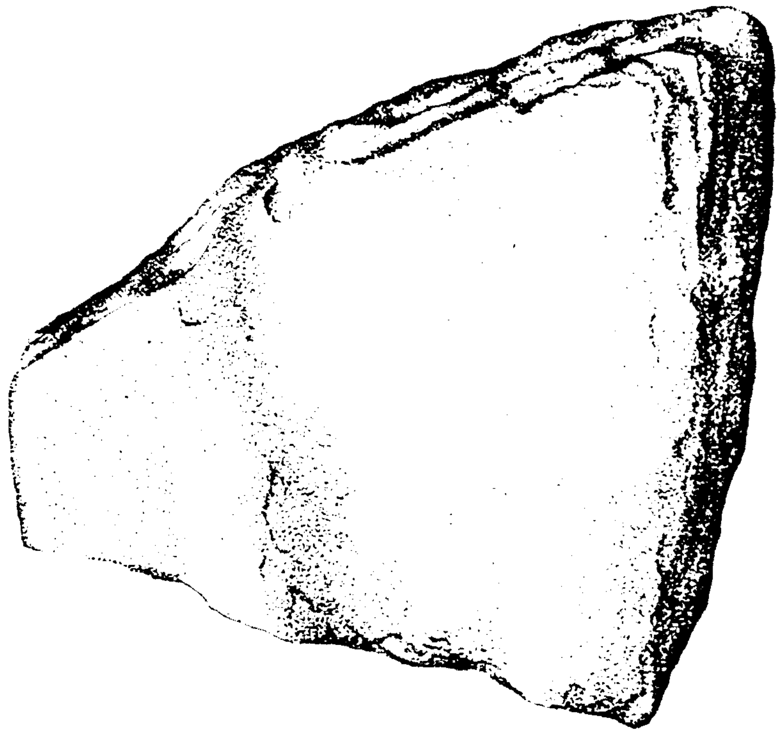

FIGURE X-19. NON-CHIPPED STONE TOOL ASSEMBLAGE CATEGORY 6 - CONCAVE FACETTED ABRADER.

House (1975:72) referred to similar concave grinding surfaces as basins that were used to pound and mark floral materials. He (House 1975:72) noted that:

> [l]arge hard sandstone or quartzite mortars, frequently in the 300 - 400 mm diameter range, are found in lowland northeast Arkansas but are not common. Frequently they are found in an exhausted condition, worn almost through from both sides. These are usually fragments and probably represent breakage during use (House 1975:72).

One aspect of these larger, heavier, sandstone artifacts is that they are not very portable. It might be expected that such artifacts would have been permanent facilities at base camps or villages. They might also be expected to occur on special activity sites where the resource being processed was relatively fixed and predictable, so that these mortars, or metates could have been cached for re-use. The Category 6 concave working surface may have been used in conjunction with the Category 7 convex grinding tool as mortar and pedestal for the processing of food materials. An anvil and chopper or pounding association, such as that described for similar artifacts from the Southwest by Dodd (1979), is not supported by the observed wear patterns on these artifacts (see Category 3).

Category 7: Convex, or Rounded Abrader (Test Pit 12, Level 2): One artifact comprises this category. It consists of a rounded sandstone cobble that exhibits wear, in the form of grinding, on most of its convex surface. It is likely that this artifact functioned as a mano, or pedestal, in conjunction with the concave grinding basins that are described in Category 6, for the processing of plant foods.

Category 8: Miscellaneous Groundstone Fragments: Artifacts included in this category are miscellaneous stone fragments that display a variety of unclassified grinding on their various surfaces. They were recovered from N152E273; Test Pit 21; Test Pit 25, Level 6; Test Pit 27, Level 2; and Features 30 and 678. With the exception of one specimen which appears to be made on rhyolite (Feature 30), all six Category 8 artifacts are made of sandstone. The function of these miscellaneous items is unknown.

Category 9: Miscellaneous Battered Fragments: The single specimen in this category, recovered from Test Pit 28, Level 1, is a heavily fragmented block of rhyolite that exhibits a variety of battering on its edges. No other kinds of wear was observed. The specific function of this large (290.0 gm), but fragmentary artifact is unknown.

Class V: Marginally Retouched Flake Tools

Artifacts included in this assemblage consist primarily of flakes which exhibit regular and continuous retouch on their marginal edges. Much of this retouch is unifacial, but these artifacts are separated from the unifacial tool assemblage and included here because no other modification of the flake blank was observed other than the regular retouch. These tools are also separated from utilized flakes which were also frequently found to exhibit fine pressure retouch on the working edges. The distinction between these two artifact classes was based upon whether the retouch observed was the result of intentional edge modification by applied pressure flaking, or if it had resulted from damage to the unmodified flake edge through use. This distinction was defined by the nature of the retouch itself. In the case of intentional retouch, uniformity, continuity and regularity was expected in the application of pressure flaking to the unmodified flake edge. Retouch resulting from damage to the unmodified flake edge was expected to be more random, sporadic and non-uniform.

Only 17 artifacts (see Table X-5, Class V) were classified as marginally retouched. Two of these were made on exhausted cores, while the remaining 15 specimens are made on flakes. Formality, in terms of shared morphological characteristics, are relatively sparse in this class of artifacts. This factor would seem to be related to the arbitrary nature by which flake-blanks were probably selected, and the ease and speed by which they could be modified into usable implements by pressure retouching.

The most consistent aspect of these marginally retouched artifacts is found in the angle of the fabricated working edge. All of the

specimens observed possessed edge angles which fell below 30° and tended to cluster at approximately 20°. This characteristic of the working edge would seem to indicate a cutting, rather than scraping function for these artifacts (Wilmsen 1970).

Another consistent attribute exhibited by this assemblage is the size of the flake on which intentional retouch occurred. The mean size, measured by relative weights in grams, of marginally retouched flakes is 3.38 gm which is far above the mean weight of flake debitage, as a whole, in the Little Cypress Bayou collection. This is obviously a function of practicality, since very small flakes are difficult to hold and would, therefore, not have been selected.

Working edge shape tended to conform to the contours of the flake margins. In general, retouch was restricted to the distal portion of the flake and/or, to one, or both sides. Working edges were therefore either straight, or convex. In only one case was a concave working edge observed and this specimen was interrupted as being a spokeshave.

Class VI: Flake Debitage

Artifacts classified as flake debitage include lithic residues produced by the process of manufacturing chipped stone tools. These were classified into four primary artifact categories that are broadly representative of progressive stages of lithic stone tool production. These categories include primary flakes, secondary flakes, interior or tertiary flakes and shatter debitage. The flakes by category and material type are summarized on Tables X-7 through X-9.

Chipped stone tool manufacturing is a reductive process that involves the removal of individual flakes from the raw material. In a sense, the desired tool form is sculptured from the raw material by these individual flake removals. Flake morphology is descriptive of the methods and technologies employed in the manufacturing process. By studying these residues researchers are provided with evidence for the occurrence, or non-occurrence of specific activities related to the manufacturing process that also includes activities associated with chipped stone tool maintenance.

Lithic tool manufacturing may also be perceived of as possessing a spatial contexts that is closely related to the process of procuring the raw material upon which stone tools were fabricated. Different stages of manufacturing may have been carried out at designated locations in conjunction with economic minimization strategies directed towards conserving raw material procurement cost. A model of hypothetical procurement strategies of this order was presented in a previous chapter, and the implications of artifact patterning resulting from the initiation of these various strategies on archaeological interpretations was also outlined.

Identifying the raw materials from which flake debitage was produced is a tenuous task in an area like the Central Mississippi Valley, where a wide range of lithic materials were located. Short of

TABLE X-7. RESULTS OF THE PHASE I FLAKE ANALYSIS.
(Page 1 of 2)

FLAKE TYPE	Primary		Secondary	Interior							Shatter Pressure			
MATERIAL	Laf.	Everton	Lafayette	Laf.	Boone	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Jeff.	Unid.
PROVENIENCE CSC														
N135/E300	1													
N150/E270					1									
N150/E370			1											
N155/E265				1							1			
N155/E270				4										
N155/E275									1	1		1		
N155/E280				1										
N155/E295				1										
N155/E300											1			
N160/E270			1	1										
N160/E275			1	2										
N160/E285				1							2			
N160/E290				1										
N160/E300				1										
N160/E310				3							1			
N160/E315				2	1	1								
N165/E270				1										
N165/E280				1										
N165/E290					1									
N165/E300				2		1								
N165/E305				3										
N165/E310				3										
N170/E270									1					
N170/E275				1										
N170/E280				1										
N170/E285	1													
N170/E295											1			
N170/E300				1										
N170/E315			1											
N175/E270				1										
N175/E275					2									
N175/E285	1		1											
N175/E300				1					1					
N175/E305				1										
N175/E310								1					1	
N175/E315									1					
N180/E280				1										
N180/E305				2										
N180/E310											4			
N185/E275			1		1									
N185/E290	1													
N185/E300									1					
N185/E310				2										

Laf. = Lafayette   Jeff. = Jefferson   Nov. = Novaculite   Unid. = Unidentified

TABLE X-7. RESULTS OF THE PHASE I FLAKE ANALYSIS.
(Page 2 of 2)

FLAKE TYPE		Primary		Secondary	Interior							Shatter Pressure			
MATERIAL		Laf.	Everton	Lafayette	Laf.	Boone	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Jeff.	Unid.
PROVENIENCE Test Pits TP	Level														
1	Ap				1				1						
	1				2										
	2								1						
2	2							1							
	6			1											
	8													1	
3	II											6			
	1			1	1										
	2A										1				
	4A			1	1										
	5				5					1					
4	4	2	1		6	1									
	5			1	1										
	7			1											
	Gen.			1	1										1
5	1	1							1			1		1	
	3	1													
	Ip											3	1		
	Gen.												1		
6	4											1			
7	1	1										1			
9	9			1											
	12											5			
10	10A			1											
12	1			1	1										
	2				1										
13	6A											1			
14	4							1							
15	I											1			
	II											1			
	6				1										
	8			1											

TABLE X-8. RESULTS OF THE PHASE II FLAKE ANALYSIS.
(Page 1 of 3)

FLAKE TYPE		Primary		Secondary		Interior						Shatter Pressure						
MATERIAL		Laf.	Boone	Laf.	Unid.	Laf.	Boone	Pitkin	Everton	Jeff.	Unid.	Laf.	Boone	Pitkin	Everton	Nov.	Dover	Unid.
PROVENIENCE TP	Level																	
Lower Midden																		
17	4					5					1							
Block 3																		
18	1					1												
	2	1								1		2						
	Gen.	1				1												
19	2B					2												
	3	1		1		6					1	3						
	4	1		6		5			1			3						
	5			1		12			1		1	6			1			1
20	5	1		2		7		1			2	7						
	6	1		1		16					1	6						
	7	3		3		5		1				1						1
	Gen.											2						
21	2					1					1							
	Gen.	2		1		4												
22	3					5					1							
	4					5					1	1						1
	5			7		4					1	6		1				
	6	1										3						1
23	2B											1						
	5	1																
	5B			2		3												
	6			2		16					3	16						
	7	1				6						4		1				
	8			1		2								1				

Laf. = Lafayette   Jeff. = Jefferson   Nov. = Novaculite   Unid. = Unidentified

TABLE X-8. RESULTS OF THE PHASE II FLAKE ANALYSIS.
(Page 2 of 3)

FLAKE TYPE		Primary		Secondary		Interior						Shatter Pressure						
MATERIAL		Laf.	Boone	Laf.	Unid.	Laf.	Boone	Pitkin	Everton	Jeff.	Unid.	Laf.	Boone	Pitkin	Everton	Nov.	Dover	Unid.
PROVENIENCE TP	Level																	
Block 3 Cont'd																		
24	2	1				3			1			2						
	3			1														
25	3			1		1						3			1			
	4	2		3		7					1	6						
	5			3	1	3						2						
	6					7					2	4						1
	7					1												
	Gen.					1						1						
26	6					16						1						
	7A	2		1		10						7						2
	7B					4						4						
	8					1						2						1
	9										1							
Block 4																		
8	1												1					
	3		1															
	7											4	1					
	Gen.											4	2			1		
16	1										1							
	4	2				2								1				
27	1					3						1						
	2	1			1	11						15						
	3			2		21				1								
	4			1		9						4						2
	5					1					1	3						
	6					3												
28	1					3						6						
	2					3					1	7						
	3					1	1					8			1			

TABLE X-8. RESULTS OF THE PHASE II FLAKE ANALYSIS.
(Page 3 of 3)

FLAKE TYPE	Primary		Secondary		Interior						Shatter Pressure						
MATERIAL	Laf.	Boone	Laf.	Unid.	Laf.	Boone	Pitkin	Everton	Jeff.	Unid.	Laf.	Boone	Pitkin	Everton	Nov.	Dover	Unid.
PROVENIENCE: TP Level																	
Upper Midden																	
N175/E283 Gen.			1														
N180/E301 L1											5						
N183/E297 L2			1								12						
N183/E299 L1											16						2
L2			1								2						
N185/E295 L2											1						
N185/E297 L2			1	1							20		1	1		1	
N185/E299 L1	1		2														
L2			1								7						
N187/E297 L2			1								18						
N187/E299 L1	1										18						
L2											5						
N187/E301 L1											1						

TABLE X-9. FLAKES RECOVERED FROM FEATURES AT 3CT50.

(Page 1 of 5)

FLAKE TYPE	Primary		Secondary	Interior								Shatter Pressure						
MATERIAL / PROVENIENCE	Laf.	Boone	Lafayette	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Unid.
30			1	6								5						
60												2						
65												1						
69				1														
72												2						
78							1					13						4
81												2						3
82						1						9						2
85											1	14			1			
86				1					2			24						1
90				1							1	22				1		3
92												4						
93												6						1
94												2						
100				1							1	14						6
103											1	1						
111												1						
113												2						
114												2						
123												1						
124												1						
126																		3
134													1					
138												1						
139												8						1
140												1						
144												5						
154												2						
163												1						
165												8						
168												1						
172				1														
178				1								2						
294				1								1						

Laf. = Lafayette   Jeff. = Jefferson   Nov. = Novaculite   Unid. = Unidentified

TABLE X-9. FLAKES RECOVERED FROM FEATURES AT 3CT50.
(Page 2 of 5)

FLAKE TYPE	Primary		Secondary	Interior								Shatter Pressure						
MATERIAL / PROVENIENCE	Laf.	Boone	Lafayette	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Unid.
212				1								14						
215													1					
218A				1														
224												1						
226						1						2						
227												3	2					
228				1								5	1					
256				1								3						
257				7	6	1			2			38	23	4	1			
259													1					
267A												2						
269												11		4				1
272												1						
277												6						
284				1								6						
286												2	1					
287				1								1			1			2
289				1								1						
290	1									1	1	19						1
295				2	1							10	7					
299				1		1						3		2				
300					2							21						1
302			1									15	2					
303												1	1					
306					2							45	9	1				
313												2						
317	2			4								6						
318				1														
322				1														
323				1								2						2
324												6		1				2
325											1	3						2
326			1	1			-					1						

TABLE X-9. FLAKES RECOVERED FROM FEATURES AT 3CT50.
(Page 3 of 5)

FLAKE TYPE	Primary		Secondary	Interior								Shatter Pressure						
MATERIAL	Laf.	Boone	Lafayette	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Unid.
PROVENIENCE																		
330												8						2
331	3		1	5								24			1			5
332				2								6						3
334												4						
338												[illegible]						
342												6						
343												19		1				2
344												2					1	
351	1	1		6					1		1	123	11	6	1			5
357				2			1					1		1				
358				1								3						
363												3						
363-655												3						
366												4						
375												3						
376				2							1	20			1			1
380												7		1				1
389							1					3						1
407																		1
409											1	2						
410	1			1								2						
417				2								1						
418												19					1	22
419A												8						
419B				1														
420				1								2		1				1
430				4							1	47		4				9
433				4								11		1				2
605												8		1				
607												6		1				2
613												1						1
615				2								12						1
617				1								3						
625				6	1	1						6			1			

TABLE X-9. FLAKES RECOVERED FROM FEATURES AT 3CT50.
(Page 4 of 5)

FLAKE TYPE	Primary		Secondary	Interior								Shatter Pressure						
MATERIAL	Laf.	Boone	Lafayette	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Unid.
PROVENIENCE																		
635												14						
636												4						
635/636												1						
637												2						
638												2						
640				4								20						[illegible]
640/635											1	1	3					
641												2		1				
642												2						
650												6						1
654				2						1	4	65			2	2		[illegible]
656				1						2	1	65		3			3	4
657												5						
658			1	1								10			1			
659	1		1									40		1				[illegible]
660												7						
664	1			3					1		6	14			1			3
665												3						2
668				1														
669												3						
671				1								3						
672												8						
675												9						1
676				1														
681												5						
684A												1						
685				1								7						
689											1	27		2				[illegible]
691				2														
705B												6	1					
705A/B				3								2						1
719				1														
728							[illegible]					3	1					
732					1					1		6	2					

TABLE X-9. FLAKES RECOVERED FROM FEATURES AT 3CT50.
(Page 5 of 5)

FLAKE TYPE	Primary		Secondary	Interior								Shatter Pressure						
MATERIAL / PROVENIENCE	Laf.	Boone	Lafayette	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Nov.	Unid.	Laf.	Boone	Pitkin	Everton	Penter	Jeff.	Unid.
736												3	2					
737					1							8	1					
745B			1															
745A/B				2								2						
746												16	7		1			4
747						2					1	21	3	3				1
748			1	1								9			1			1
766			1									8						1
768												6			3			2
769												18						1
771												6						
773												4						
774				1								8						
775												5						
778												18						3
779	1																	
730					1							9						1
781												1						
782												2						
787				2								20						
788												8						
799												1						
11				2								1						
9			1															
5								1				1						1
82												6						
826												2						
829				1								2						
829												7						
839												1						
841	2		1															
906												1						
1001				2							1	19		3	1			6
1002				1								6						2
1003				1								48		1				5

highly technical and expensive methods, such as neutron activation, the identification of the material sources of lithic artifacts recovered from archaeological sites is dependant upon the familiarity of the analysts with the wide physical range of material appearances that various lithic resources often tend to exhibit. Enough homogeneity exists, however, within the physical appearance of the more prevalent stone resources, that with a large enough sample, visual identification should produce only marginal errors.

Identifying the association of lithic material sources with the different categories of flake residue provides an indication of the spatial relationship between those resources and these prehistoric users that can be defined in economic terms. This association may also be extended to the sphere of prehistoric social relationships that pertain to the inter-regional exchange of lithic raw materials and finished chipped stone artifacts, between groups.

Flake debitage, often being classified into one of the four categories previously mentioned, was both counted and weighed. Individual counts on flake residues provides direct evidence of instances, or occurrences of past activities related to the chipped stone tool manufacturing process. Weight, on the other hand, is an economic variable that can produce indications of the reliance upon a particular resource, as well of the relative value of such resources in terms of how efficiently that resource was utilized.

<u>Category 1: Primary Flake Debitage</u>: Primary flakes are those chipped stone residual artifacts that display a predominance of weathered cortex on their dorsal surfaces. These artifacts were the first flakes to be detached from a block of raw material that, in its unmodified state, occurs as a weathered cobble. As such, primary debitage is indicative of the initial stages of the reductive process that is related to stone tool manufacturing. In the Little Cypress Bayou site assemblage only 1.9 percent (N=50) of the total debitage recovered was classified as primary flake debitage. This seems to strongly indicate that the initial stages of chipped stone tool manufacturing were consistently taking place at locations probably near to the original sources of raw materials and not at the Little Cypress Bayou site.

<u>Category 2: Secondary Flake Debitage</u>: Secondary flake debitage is identified by the retention of only marginal amounts of weathered cortex, and the presence of flake scars on their dorsal surfaces that are indicative of previous removals. Secondary debitage is diagnostic of more advanced, or progressed stages in the reductive process over those stages produced primary-flake debitage. Frequently, different removal, or flaking techniques were employed in these latter stages of manufacturing. Hard-hammer flake removal techniques are often associated with initial reduction activities because, although there is less control over individual flake removals, this technique is more efficient in removing the cortex material from a cobble of raw material. It is also a useful technique in removing a specified flake blank for which there are certain size and thickness requirements.

Secondary flake removals, on the other hand, are often associated with soft-hammer percussion techniques. The application of each manufacturing techniques provides greater control over flake removals that is of increasing necessity as the reduction process progresses.

In the Little Cypress Bayou collection, 2.7 percent (N=73) of the total debitage assemblage was classified as secondary flake debitage. These figures, again, seem to indicate that much of the activities associated with stone tool production were occurring elsewhere than at this site. The slight increase in the occurrence of secondary flakes over primary flakes may actually be due to a relatively standard ratio between these flake classes that is often observed in the reductive process, than to differences in the spatial occurrences of the manufacturing stages associated with each. Secondary flakes are almost always more prolific in occurrence than primary flakes because most of the cobble cortex can often be removed from the desired tool form with relatively few flake detachments.

<u>Category 3: Interior (Tertiary) Flake Debitage</u>: Interior flake debitage includes those residual artifacts that retain no cortex on their dorsal surfaces. These artifacts were produced when all the weathered cortex had been removed from the desired tool form, and were, therefore, diagnostic of more advanced stages of manufacturing over the previous two flake categories. Interior flakes more often are associated with soft hammer percussion and pressure flaking techniques of flake removal. Greatest control over individual flake removals are achieved by employing the latter techniques, and flakes produced by this method are usually associated with the final finishing of the artifact form. Pressure flakes also tend to be produced by tool maintenance activities, especially with regard to the rejuvenation of dulled cutting edges.

The proliferation of interior flakes, and particularly very small interior flakes produced by pressure flaking, in the Little Cypress Bayou collection, suggests that of the tool reduction trajectory, the final stages of tool manufacturing and probably more importantly, stone tool maintenance were frequent activities at this site. Interior flakes accounted for 19.6 percent (N=517) of the debitage assemblage. The recycling and rejuvenation of worn-out tools was probably related to the cost incurred in obtaining a unit quantity of a specific raw material. High raw material cost would be expected to have produced behavior associated with material conservation and expanding tool use-life through rejuvenation of dulled working edges.

<u>Category 4: Shatter and Amorphous Flake Debitage</u>: Artifacts included in this category are fragments of debitage that because they are incomplete, were not validly classified into the above categories. This category also includes fragmented or amorphous pieces of stone that do not exhibit conchoidal fracturing but were produced by flaws inherent in the raw material, or by the misapplication of force in pressure, or percussion techniques. A total of 1991 specimens (75.6 percent) were included in this category. A very large percentage of

this category was probably produced by pressure flaking. However, flakes produced by pressure flaking are often very difficult to discern from shatter produced by other techniques (Shafer 1973). The recovery of pressure flakes and amorphous shatter, compared to other larger categories of flake debitage is often related to recovery techniques, and samples of debitage, in this respect, are comparable only when recovery techniques were employed which are conducive to the recovery of small as well as large artifacts.

Fire Cracked Rock

While Table X-10 suggests that a quantity of FCR was recovered during the controlled surface collections and excavations, the actual number is quite low. In total, 1166.61 gm (41.15 oz) of FCR were identified, which is actually only 2.57 lbs. The low incidence precludes any real interpretation of the FCR presence. A check of the features which yielded FCR was made, however, and indicated that there is no correlation between its occurrence and feature type, the presence or absence of heat treatment of lithics, or the presence or absence of burnt clay.

Summary of Lithic Analyses

The chipped stone and groundstone artifacts recovered from 3CT50, though few in number, did afford some data relevant to the definition of temporal components at the site, and range of occupation functions. With regard to the first issue, the data suggest that a sparse Archaic use of the area is possible. However, many of the Archaic points also evidence re-sharpening and re-use along edges which may indicate that subsequent populations were collecting and reworking the items.

The range of lithic tools is limited, as is the variety of materials upon which they were manufactured. These aspects of the collection, coupled with the extremely low incidence of primary and secondary flakes, suggest three possibilities. First, based on the characteristics of the flake collection it appears that primarily lithic maintenance activities were being conducted at the site. This conclusion appears to be valid for all the occupations. The low number of cores, primary and secondary flakes and the single hammerstone reinforces the notion that little in the way of lithic tool manufacturing was being conducted by the 3CT50 inhabitants.

Secondly, the groundstone recovered is almost uniformly in exhausted or fragmented condition. The implication seems to be that the items, if not the material upon which they were made, was dear to the users. There is no evidence from the 3CT50 collection to suggest that groundstone implements were manufactured at the site.

Third, and specific to raw materials used, the collection is clearly dominated by items made from Lafayette chert, which is the nearest obtainable (e.g., Crowley's Ridge) lithic material to the site. Materials from source locations at greater distance were

TABLE X-10. FIRE CRACKED ROCK RECOVERED FROM 3CT50.
(Page 1 of 2)

PROVENIENCE	SAMPLE	WEIGHT [gm]
Controlled Surface Collection [CSC]		
N150E265	CSC	.7
N150E270	CSC	3.2
N150E280	CSC	19.5
N150E290	CSC	2.1
N155E295	CSC	9.2
N155E300	CSC	6.3
N155E310	CSC	1.0
N160E270	CSC	19.8
N160E275	CSC	4.2
N160E280	CSC	1.0
N160E310	CSC	7.8
N160E315	CSC	31.6
N165E300	CSC	19.0
N165E310	CSC	3.4
N170E285	CSC	7.6
N170E290	CSC	2.4
N170E310	CSC	26.3
N175E270	CSC	7.9
N175E275	CSC	28.4
N175E290	1/4" water screen	60.3
N175E300	CSC	2.5
N175E305	CSC	2.0
N175E310	CSC	8.0
N175E315	CSC	2.8
N180E275	CSC	3.4
N180E280	CSC	23.0
N180E285	CSC	9.6
N180E290	CSC	98.0
N180E315	CSC	1.4
N185E270	CSC	69.0
N185E290	CSC	36.0
N185E300	CSC	11.4
N185E310	CSC	2.0
N185E315	CSC	3.7
N225E349	CSC	3.2
Test Pits		
TP1, L1	1/4" water screen	4.7
TP3, L2A	1/4" water screen	4.2
TP3, L2B	1/4" water screen	22.0
TP3, L4A	1/4" water screen	23.4
TP3, L5	1/4" water screen	9.0
TP4, L4	1/4" water screen	7.0
TP4, L5	1/4" water screen	1.9
TP4, L6	1/4" water screen	15.8
TP5, L1	1/4" water screen	0.5
TP6, L1	1/4" water screen	2.9
TP8, L4	1/4" water screen	21.3
TP8, L6A	1/4" water screen	3.1
TP12, L1	1/4" water screen	2.5
TP12, L3, Str. Ab	Flotation	1.0
TP12, L3	1/4" water screen	0.3
TP15, L1	1/4" water screen	22.5
TP15, L6	1/4" water screen	2.6

TABLE X-10. FIRE CRACKED ROCK RECOVERED FROM 3CT50.
(Page 2 of 2)

PROVENIENCE	SAMPLE	WEIGHT [in gm]
Test Pits Cont'd		
TP16, L4, Seg. B	1/4" water screen	12.6
TP20, L7, S1/2	1/4" water screen	3.6
TP22, L3	1/4" water screen	47.7
TP22, L3, N1/2	1/4" water screen	45.5
TP22, L4, N1/2	1/4" water screen	8.0
TP22, S1/2	1/4" water screen	18.0
TP25, L7, S1/2	1/4" water screen	2.3
TP25, L9, N1/2	1/4" water screen	14.6
TP26, L6, N1/2	1/4" water screen	7.6
TP26, L7A, N1/2	1/4" water screen	13.4
TP26, L7A, S1/2	1/4" water screen	5.4
TP26, L7B, S1/2	1/4" water screen	1.7
TP26, L7B	1/4" water screen	8.1
TP26, L8, N1/2	1/4" water screen	3.3
TP26, L8, S1/2	1/4" water screen	6.9
TP27, L2, N1/2	1/4" water screen	2.3
TP27, L2, S1/2	1/4" water screen	54.0
TP28, L1, N1/2	1/4" water screen	6.7
TP28, L3	1/4" water screen	11.6
TP28, L6, S1/2	1/4" water screen	11.8
N183E297, L2, SW	Flotation	2.4
N183E299, L2	Flotation	0.6
N185E299, L2	Flotation	0.1
Features		
F11	1/4" water screen	1.5
F12, L7	Flotation	0.1
F94, Str. A/B	Flotation	2.3
F102	1/4" water screen	13.5
F212	Flotation	0.9
F254	1/4" water screen	14.1
F270	Flotation	1.4
F294	Flotation	0.4
F299	Flotation	0.4
F302	Flotation	0.5
F325	Flotation	0.9
F332	Flotation	1.0
F363/F655	Fine screen	0.7
F376, Str. A	Flotation	3.6
F403	Flotation	71.5
F430	Fine screen	8.2
F615	Fine screen	3.6
F635	Fine screen	1.1
F640	Flotation	3.5
F747	Flotation	6.0
F769	Flotation	2.7
F779	Flotation	1.9
F801	Flotation	0.01
F807	Flotation	5.0
F824	Flotation	1.0
F829	Flotation	0.9
F841	Flotation	29.0
F842	Flotation	2.7
F900	Flotation	9.4
F903	Flotation	5.2

little used; of these "exotic" types, the most prevalent were the cherts from the Ozark region. These various aspects of the collection are detailed in Chapter Five of Volume I.

WORKED BONE

As with other non-subsistence categories, the incidence of worked or possibly worked bone recovered from 3CT50 was minimal. Table X-11 summarizes these materials.

Although the amount of worked bone (including antler) is limited, the small collection nonetheless suggests that the 3CT50 inhabitants were relying on mammal bone almost exclusively in the production of tools. The presence of modified antler tine (and in three other Baytown features [343, 413 and 419] unmodified antler) would be in keeping with the lithic maintenance activities conducted at the site. Whether they were actually being used for such a function has not, however, been determined.

The function of the remaining objects in the collection is less open to interpretation. The possible uses of tapered, or pointed objects in basketry or clothing manufacture and ceramic decoration is well documented in the ethnographic literature. Again, the actual function of the objects recovered is undetermined.

TABLE X-11. SUMMARY OF WORKED AND POSSIBLY WORKED BONE RECOVERED FROM 3CT50.

Provenience	Cultural Affiliation	Species	Description
Feature 299, Level A	Baytown	White-tailed deer	Antler base with tine chopped off
Feature 749, Level A	Baytown	White-tailed deer	Antler tine with possible polish
Feature 905	Baytown	White-tailed deer	Distal metacarpal with grooved sides. The distal end may have been cut.
Feature 133	Late Baytown	Unid. mammal bone	A bipointed object; Dr. Arthur Bogan offered the suggestion that it may have functioned as a fish gorge.
Feature 729	Late Baytown	Unid. mammal bone	Splinter which is worked
Feature 841	Late Baytown	White-tailed deer	Chopped antler tine
Feature 302	Mississippian	Unid. mammal bone	Object has been ground to a tapered, but blunt point
Feature 654	Mississippian	Unidentified bone	Fragment has been ground to a very sharp, narrow point
Feature 183	Undetermined	Unidentified bone	Fragment has been worked (no other available information)

APPENDIX X - BIBLIOGRAPHY

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APPENDIX XI

3CT50 SCOPE-OF-WORK

Attached is Section C of the 3CT50 Scope-of-Work (Solicitation No. DACW66-82-R-0064). Various regulation and definition sections have not been included, as these parts are included in all solicitation packages.

INFORMATION TO OFFERORS OR QUOTERS *(Section A - Cover Sheet)*	SOLICITATION NUMBER DACW66-82-R-0064 ☐ ADVERTISED *(IFB)* ☒ NEGOTIATED *(RFP)* ☐ NEGOTIATED *(RFQ)*

ISSUING OFFICE *(Complete mailing address including Zip Code)*

Department of the Army
Memphis District, Corps of Engineers
B-314 Clifford Davis Federal Building
Memphis, Tennessee 38103

ITEM(s) TO BE PURCHASED *(Brief description)*

Archeological Mitigation Analysis and Report Preparation for a Portion of Site 3CT50 on Big Creek, Item 2, Crittenden County, Arkansas

THIS PROCUREMENT IS:

☐ UNRESTRICTED ☒ SET-ASIDE *(This is a 100 % set-aside for ☒ Small Business, ☐ Labor Surplus Area Concerns or ☐ Combined Small Business/Labor Surplus Area Concerns.) (See Section L of the Table of Contents in this solicitation for details of the set-aside.)*

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

You are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure to agree to the certification will render your reply nonresponsive to the terms of solicitations involving awards of contracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause.

"Fill-ins" are provided on the face and reverse of Standard Forms 18 and 33, or other solicitation documents and Sections of Table of Contents in this solicitation and should be examined for applicability.

See the paragraph of this solicitation entitled "Late Bids, Modifications of Bids or Withdrawal of Bids" or "Late Proposals, Modifications of Proposals and Withdrawals of Proposals".

The envelope used in submitting your reply must be plainly marked with the Solicitation Number, as shown above and the date and local time set forth for bid opening or receipt of proposals in the solicitation document.

If NO RESPONSE is to be submitted, detach this sheet from the solicitation, complete the information requested on reverse, fold, affix postage, and mail. NO ENVELOPE IS NECESSARY.

Replies must set forth full, accurate, and complete information as required by this solicitation *(including attachments)*. The penalty for making false statements is prescribed in 18 U.S.C. 1001.

ADDITIONAL INFORMATION

"THIS IS A CIVIL WORKS PROGRAM PROCUREMENT AND IS NOT FUNDED BY THE DEPARTMENT OF DEFENSE.

BUY AMERICAN ACT PRICE DIFFERENTIAL TO FOREIGN QUALIFYING COUNTRY END PRODUCTS IN ACCORDANCE WITH PARAGRAPH 6-104.4(f) OF THE DEFENSE ACQUISITION REGULATION APPLIES."

FOR INFORMATION ON THIS PROCUREMENT WRITE OR CALL

NAME AND ADDRESS	TELEPHONE *(Area Code, No. & Ext.)*	NO COLLECT CALLS

DD FORM 1707, 1 FEB 76 REPLACES DD FORMS 1706 AND 1707 WHICH ARE OBSOLETE

NO RESPONSE FOR REASONS CHECKED			
	CANNOT COMPLY WITH SPECIFICATIONS		CANNOT MEET DELIVERY REQUIREMENT
	UNABLE TO IDENTIFY THE ITEM(S)		DO NOT REGULARLY MANUFACTURE OR SELL THE TYPE OF ITEMS INVOLVED
	OTHER *(Specify)*		
	WE DO		WE DO NOT, DESIRE TO BE RETAINED ON THE MAILING LIST FOR FUTURE PROCUREMENT OF THE TYPE OF ITEM(S) INVOLVED

NAME AND ADDRESS OF FIRM *(Include Zip Code)*	SIGNATURE
	TYPE OR PRINT NAME AND TITLE OF SIGNER

FROM:

AFFIX STAMP HERE

TO: Department of the Army
Memphis District, Corps of Engineers
B-314 Clifford Davis Federal Building
Memphis. Tennessee 38103

SOLICITATION NO. DACW66-82-R-0064

DATE AND LOCAL TIME C.O.B. 82 JUL 16

Request for Proposal No. DACW66-82-R-0064

SECTION C

SCOPE OF WORK

Archaeological Mitigation of Site 3CT50, Crittenden County, Arkansas

1. General

1.01. The mitigation and report of activities at site 3CT50 are in partial fulfillment of the Memphis District's obligations under the National Historic Preservation Act of 1966 (P.L. 89-665); the National Environment Policy Act of 1969 (P.L. 91-190); Executive Order 11593, "Protection and Enhancement of Cultural Environment," 13 May 1971 (36 F.R. 3921); Preservation of Historic and Archaeological Data, 1974 (P.L. 93-291); and the Advisory Council on Historic Preservation, "Procedures for the Protection of Historic and Cultural Properties" (36 CFR VIII Part 800).

1.02. Personnel Standards

a. The Contractor shall utilize a systematic, interdisciplinary approach to conducting the study. Specialized knowledge and skills will be used during the course of the study to include expertise in archaeology, history, geology and other disciplines as required. Techniques and methodologies used for the study shall be representative of the state of current professional knowledge and development.

b. The following minimal experiential and academic standards shall apply to personnel involved in cultural resources investigations described in this Scope of Work:

1. Archeological Project Directors or Principal Investigators (PI). Individuals in charge of an archeological project or research investigation contract, in addition to meeting the appropriate standards for archaeologist, must have a publication record that demonstrates extensive experience in successful field project formulation, execution and technical monograph reporting. The Contracting Officer may also require suitable professional references to obtain estimates regarding the adequacy of prior work.

2. Archaeologist. The minimum formal qualifications for individuals practicing archaeology as a profession are a B.A. or B.S. degree from an accredited college or university, followed by a minimum of two years of successful graduate study with concentration in anthropology and specialization in archeology and at least two summer field schools or their equivalent under the supervision of archeologists of recognized competence. A Master's thesis or its equivalent in research and publication is highly recommended, as is the M.A. degree.

3. Other Professional Personnel. All non-archeological personnel utilized for their special knowledge and expertise must have a B.A. or B.S. degree from an accredited college or university, followed by a minimum of one year of successful graduate study with concentration in appropriate study.

4. Other Supervisory Personnel. Persons in any archeological supervisory position must hold a B.A., B.S. or M. A. degree with a concentration in archeology and a minimum of 2 years of field and laboratory experience.

5. Crew Members and Lab Workers. All crew members and lab workers must have prior experience compatible with the tasks to be performed under this contract. An academic background in archeology/anthropology is highly recommended.

c. All operations shall be conducted under the supervision of qualified professionals in the discipline appropriate to the data that is to be discovered, described or analyzed. Vitae of personnel involved in project activities may be required by the Contracting Officer at anytime during the period of service of this contract.

1.03. The Contractor shall designate in writing the name of the Principal Investigator. Participation time of the Principal Investigator shall average a minimum of 50 hours per month during the period of service of this contract. In in the event of controversy or court challenge, the Principal Investigator shall be available to testify with respect to report findings. The additional services and expenses would be at Government expense, per paragraph 1.08 below.

1.04. The Contractor shall keep standard field records which may be reviewed by the Contracting Officer. These records shall include field notes, site forms and any other cultural resource forms and/or records, field maps and photographs necessary to successfully implement requirements of this Scope of Work.

1.05. To conduct the field investigation, the Contractor will obtain all necessary permits, licenses, and approvals from all local, state and Federal authorities. Should it become necessary in the performance of the work and services of the Contractor to secure the right of ingress and egress to perform any of the work required herein on properties not owned or controlled by the Government, the Contractor shall secure the consent of the owner, his representative, or agent, prior to effecting entry on such property.

1.06. Innovative approaches to data location, collection, description and analysis, consistent with other provisions of this contract and the cultural resources requirements of the Government, are encouraged.

1.07. No mechanical power equipment shall be utilized in any cultural resource activity, other than that outlined in paragraph 4.02b(6) and (10), without specific written permission of the Contracting Officer.

1.08. The Contractor shall furnish expert personnel to attend conferences and furnish testimony in any judicial proceedings involving the archaeological and historical study, evaluation, analysis and report. When required, arrangements for these services and payment therefor will be made by representatives of either the Corps of Engineers or the Department of Justice.

1.09. The Contractor, prior to the acceptance of the final report, shall not release any sketch, photograph, report or other material of any nature obtained or prepared under this contract without specific written approval of the Contracting Officer.

1.10. The extent and character of the work to be accomplished by the Contractor shall be subject to the general supervision, direction, control and approval of the Contracting Officer. The Contracting Officer may have a representative of the Goverrment present during any or all phases of the described cultural resource project.

2. Study Area. The study area is defined as the right-of-way limits for Big Creek, Item 2, Crittenden County, Arkansas, beginning at Station 684+49 and ending at Station 694+85 (containing site 3CT50) as shown on drawing, serial number 20881, file 41K/387(3) and map entitled "Big Creek, Item 2, 3CT50 Site Boundaries."

3. Definitions.

3.01. "Cultural resources" are defined to include any buildings, site, district, structure, object, data, or other material relating to the history, architecture, archeology, or culture of an area.

3.02. "Background and Literature Search" is defined as a comprehensive examination of existing literature and records for the purpose of inferring the potential presence and character of cultural resources in the study area. The examination may also serve as collateral information to field data in evaluating the eligibility of cultural resources for inclusion in the National Register of Historic Places or in ameliorating losses of significant data in such resources.

3.03. "Intensive Survey" is defined as a comprehensive, systematic, and detailed on-the-ground survey of an area, of sufficient intensity to determine the number, types, extent and distribution of cultural resources present and their relationship to project features.

3.04. "Mitigation" is defined as the amelioration of losses of significant prehistoric, historic, or architectural resources which will be accomplished through preplanned actions to avoid, preserve, protect, or minimize adverse effect upon such resources or to recover a representative sample of the data they contain by implementation of scientific research and other professional techniques and procedures. Mitigation of losses of cultural resources

includes, but is not limited to, such measures as: (1) recovery and preservation of an adequate sample of archaeological data to allow for analysis and published interpretation of the cultural and environmental conditions prevailing at the time(s) the area was utilized by man; (2) recording, through architectural quality photographs and/or measured drawings of buildings, structures, districts, sites and objects and deposition of such documentation in the Library of Congress as a part of the National Architectural and Engineering Record; (3) relocation of buildings, structures and objects; (4) modification of plans or authorized projects to provide for preservation of resources in place; (5) reduction or elimination of impacts by engineering solutions to avoid mechanical effects of wave wash, scour, sedimentation and related processes and the effects of saturation.

3.05. "Reconnaissance" is defined as an on-the-ground examination of selected portions of the study area, and related analysis adequate to assess the general nature of resources in the overall study area and the probable impact on resources of alternate plans under consideration. Normally reconnaissance will involve the intensive examination of not more than 15 percent of the total proposed impact area.

3.06. "Significance" is attributable to those cultural resources of historical, architectural, or archaeological value when such properties are included in or have been determined by the Secretary of the Interior to be eligible for inclusion in the National Register of Historic Places after evaluation against the criteria contained in How to Complete National Register Forms.

3.07. "Testing" is defined as the systematic removal of the scientific, prehistoric, historic, and/or archaeological data that provide an archeological or architectual property with its research or data value. Testing may include controlled surface survey, shovel testing, profiling, and limited subsurface test excavations of the properties to be affected for purposes of research planning, the development of specific plans for research activities, excavation, the development of specific plans for research activities, preparation of notes and records, and other forms of physical removal of data and the material analysis of such data and material, preparation of reports on such data and material and dissemination of reports and other products of the research. Subsurface testing shall not proceed to the level of mitigation.

3.08. "Analysis" is the systematic examination of material data, environmental data, ethnographic data, written records, or other data which may be prerequisite to evaluate adequately those qualities of cultural loci which contribute to their significance.

4. Description of Investigations.

4.01. Work required in this Scope of Work shall be accomplished by phases. The determination as to whether Phase II investigations will be required will be made by the Contracting Officer at the completion of Phase I. If Phase II is not required, the work will proceed to from Phase I to Phase III. The Contracting Officer may elect (1) to proceed with Phase II and Phase III work, or (2) to order the precise locating, recording and description of all individual subsurface cultural resources exposed in Phase I and the resealing of the site and initiation of Phase III work, with the determination that Phase II work is not warranted. If the determination is made to perform Phase II, the Contractor will be so notified in writing and negotiations for a change order will be scheduled at a mutually agreeable time.

4.02. Phase I - Research Design and Intensive Site Testing.

a. Research Design. (1) The Contractor shall develop a research design explicitly relating pre-fieldwork research, field activity and analysis to specific archeological problems or problem domains. The research design shall also address the mode of curation necessary to maximize the research potential of any collections. This research design shall be submitted to the Contracting Officer for approval prior to the beginning of field work. The Contractor shall also submit a copy of the research design concurrently to the State Archeologist of Arkansas for review. The research design, while oriented towards specific archeological goals and problems, will be flexible enough to incorporate new or additional orientations if these should become appropriate.

(2) It is essential that the research design submitted by the Contractor be consistent with, and satisfy requirements of Part III, Section III, IV, V and VI of "Treatment of Archeological Properties," published November 1980 by the Advisory Council on Historic Preservation. The research design shall address appropriate research problems and problem domains contained in the Arkansas State Historic Preservation Plan as well as relevant research problems and problem domains which the Principal Investigator may identify during research prior to the submission of the research design.

b. Intensive Site Testing. (1) Phase I intensive site testing shall include the marking of site areas to be impacted by construction activity, the definition of site boundaries, the excavation of 1 X 1 meter test units, controlled surface collection, location and marking of subsurface deposits and the protection of exposed deposits until further actions, described in paragraph 4.02a(1) are determined by the Contracting Officer. These activities shall take place within the area of potential project impact. This area consists of all 3CT50 site areas within the channel enlargement right-of-way limits (approximately 4,200 square meters) plus a portion of the road construction right-of-way paralleling the county gravel road which bisects the site (approximately 1,400 square meters).

(2) The Contractor shall not begin intensive site testing until so directed by the Contracting Officer. The Contracting Officer may elect not to issue such directive until the Advisory Council on Historic Preservatio has been consulted with regard to the Contractor produced research design described in paragraph 4.02a(1).

(3) The marking of site areas to be mitigated (the area of potential project impact) shall be performed by the Government prior to the beginning of Contractor fieldwork.

(4) The Contractor shall derive 3CT50 site boundaries by appropriate archaeological methods in such a manner as to allow precise plotting of site boundaries on Government project drawings and 7.5 minute USGS quad maps when available. Methods used to establish site boundaries shall be discussed in the report of investigations together with the probable accuracy of the boundaries. The Contractor shall establish a datum at site 3CT50 which shall be precisely related to the site boundaries as well as to a permanent reference point (in terms of azimuth and distance). If possible, the permanent reference point used shall appear on Government blueline (project) drawings and/or 7.5 minute USGS quad maps. If no permanent landmark is available, a permanent datum shall be established in a secure location for use as a reference point. The permanent datum shall be precisely plotted and shown on USGS quad maps and project drawings. All descriptions of site location shall refer to the location of the primary site datum.

(5) The Contractor shall excavate a minimum of ten (10) 1 X 1 meter test units in order to gain definative information concerning plowzone depth and the extent and general nature of subsurface deposits. Subsurface test units shall be excavated in levels no greater than 10 centimeters. Where cultural zonation or plow disturbance is present, excavated materials shall be removed by zones (and 10 cm. levels within zones where possible). Subsurface test units shall extend to a depth of at least 20 centimeters below artifact bearing soils. A portion of each test unit, measured from one corner (of a minimum 30 X 30 centimeters), shall be excavated to a depth of 40 centimeters below artifact bearing soils. All excavated material (including plowzone material) shall be screened using a minimum of 1/4" hardware cloth. Representative profile drawings shall be made of excavated units. When intact subsurface cultural features are encountered, they shall be cleaned, examined and recorded. Such deposits shall not be excavated in Phase I. When units containing such deposits are discovered they shall be backfilled and cultural features removed in Phase II.

(6) Following the excavation of test units, the site areas to be examined shall be plowed, disced and watered by either natural or mechanical means. The Contractor shall exercise caution in insuring that plowing procedures do not disturb previously undisturbed cultural deposits and that watering procedures are adequate to insure excellent collection conditions.

(7) Following these procedures, controlled surface collection of the entire area of potential project impact shall be obtained by the Contractor. Care should be taken to avoid bias in collecting certain classes of data or artifact types to the exclusion of others (ex: debitage or faunal remains) so as to insure that collections accurately reflect both the full range and the relative proportions of data classes present (ex: the proportion of debitage to implements or types of implements to each other). Such a collecting strategy shall require the total collection of quadrat. No individual sample unit type used in surface data collection shall exceed 36 square meters in area.

(8) The Contractor shall undertake (in addition and subsequent to sample surface collecting) a general site collection in order to increase the sample size of certain classes of data which the Principal Investigator may deem prerequisite to an adequate site-specific and intersite evaluation of data.

(9) In addition to these collections, the Contractor shall undertake such collecting procedures in other site areas as the Principal Investigator may deem necessary to gain an adequate understanding of the portion of the site area to be mitigated; however, in any event, previously undisturbed cultural deposits shall not be disturbed.

(10) Following surface collecting, plowzone deposits in the area of potential project impact shall be removed by mechanical and/or hand excavation. Since undisturbed cultural deposits, including human burials, are expected to be present contiguous to the plowzone, (particularly in the road construction right-of-way), extreme care should be excercised in the use of power equipment. It is anticipated that the use of power equipment in certain site areas will be totally inappropriate due to potential damage to subsurface cultural deposits. In these areas, shovel removal of the plowzone shall be used. The Contractor should be quided in determining the method of plowzone removal by data collected in test units, controlled surface collections as well as general site observations and observations made during plowzone removal. The Principal Investigator shall be present at all times during plowzone removal. In addition, trowelling will be performed in removing plowzone deposits when deemed by the Principal Investigator to be required in order to maximize the detection or definition of cultural resources. Following detection, subsurface cultural deposits will be securely marked.

(11) As soon as possible but, in any case, no later than seven (7) calendar days, the Contractor shall submit to the Contracting Officer a management summary describing the numbers, approximate size and general nature of all subsurface cultural deposits located.

(12) The Contractor shall insure the constant protection of exposed cultural deposits from weathering and vandalism following their exposure until subsequent actions directed by the Contracting Officer pursuant to paragraph 4.01 are begun. Unless otherwise directed by the Contracting Officer, such protection shall not exceed 30 calendar days.

4.03. Phase II - Data Recovery.

(a) Following Phase I activities, and upon receipt of the Change Order to proceed with Phase II from the Contracting Officer, the Contractor shall excavate and remove all subsurface features or other cultural deposits in the area of potential project impact.

(b) Fill from all removed subsurface deposits shall be screened using hardware cloth of a maximum mesh size of 1/4." Samples of fill shall be fine screened using 1/32" or smaller hardware cloth. Similar samples shall be subjected to flotation procedures. The fill portion to be fine screened and flooted shall be a sample fraction adequate to fulfill requirements of the research design.

(c) Where appropriate, adequate samples shall be taken in order to allow the evaluation of cultural deposits by Carbon 14, Paleomagnetic, Edaphic, Paleobatonical and Zooarcheological analysis. In addition, Palynological samples shall be obtained from the site and/or vicinity. The sample fractions obtained shall be sufficient to adequately fulfill the requirements of the research design described in paragraph 4.02a(1). Human skeletal remains recovered shall also be analyzed in sufficient detail to fulfill requirements of the research design.

(d) Subsequent to removal of subsurface deposits, the Contractor shall install solid core test units or screened post hole units at intervals no less than fifteen (15) meters across the work area for evidence of deeply buried deposits. These units shall extend to a minimum depth of 100 cms below current ground surface.

4.04. Phase III - Analysis and Reporting. Phase III activities shall consist of analysis and reporting of all data recovered or examined in Phase I and Phase II activities. If the Contractor has not performed Phase II activities, reporting and analysis shall consist of Phase I activities only.

4.05. Analysis and Curation. Unless otherwise indicated, artifactual and non-artifactual analysis shall be of an adequate level and nature to fulfill the requirements of this Scope of Work. All recovered cultural items shall be cataloged in a manner consistent with state requirements or standards of curation in the state in which the study occurs. The Contractor shall consult with appropriate state officials as soon as possible following the conclusion of fieldwork in order to obtain information (ex: accession numbers) prerequisite to such cataloging procedures. The Contractor shall have access to a depository for notes, photographs and artifacts (preferably in the state in which the study occurs) where they can be permanently available for study by qualified scholars. If such materials are not in Federal ownership, applicable state laws, if any, should be followed concerning the disposition of the materials after the completion of the final report. Efforts to insure the permanent curation of properly cataloged cultural resources materials in an appropriate institution shall be considered an integral part of the requirements of this Scope of Work.

5. General Report Requirements.

5.01. The primary purpose of the cultural resources report is to serve as a planning tool which aids the Government in meeting its obligations to preserve and protect our cultural heritage. The report will be in the form of a comprehensive, scholarly document that not only fulfills mandated legal requirements but also serves as a scientific reference for future cultural resources studies. As such, the report's content must be not only descriptive but also analytic in nature.

5.02. Upon completion of all field investigation and research, the Contractor shall prepare reports detailing the work accomplished and results. The format suggested by Standards for Fieldwork and Reports as prepared by the Office of the Arkansas State Archeologist should be reviewed and, to the extent allowed by this Scope of Work utilized in preparing the required report.

5.03. The report shall include, but not necessarily be limited to, the following sections and items:

a. Title Page. The title page should provide the following information; the type of task undertaken, the cultural resources which were assessed (archeological, historical, architectural); the project name and location (county and state), the date of the report; the Contractor's name; the contract number; the name of the author(s) and/or the Principal Investigator; and the agency for which the report is being prepared.

b. Abstract. The abstract should include a summary of the nature and results of activities and the conclusions of the Principal Investigator.

c. Table of Contents.

d. Introduction. This section shall include the purpose of the report; a description of the proposed project; a map of the general area; a project map; and the dates during which the tasks were conducted. The introduction shall also contain the name of the institution where recovered materials will be curated.

e. Environmental Context. This section shall contain, but not be limited to, a discussion of probable past floral and faunal characteristics of the project area. It is imperative that the quantity and quality of environmental data be sufficient to allow detailed analysis of the relationship between past cultural activities and environmental variables.

f. Previous Research. This section shall describe previous research which was used in deriving or interpreting relevant background research data, problem domains, or research questions and in providing a context in which to examine the probability of occurrence and significance of cultural resources in the study area.

g. Literature Search and Personal Interviews. This section shall discuss the results of the literature search, including specific data sources, and personal interviews which were conducted during the course of investigations.

h. Research Design and Study Methods. This section shall contain the research design and should contain an explicit discussion of how environmental data, previous research data, the literature search and personal interviews have been utilized in constructing and implementing such a strategy.

i. Investigation Results. This section shall discuss data derived from investigations, the nature and results of analysis, and the scientific importance or significance of the work. Quantified listings and descriptions of artifacts and their proveniences may be included in this section or added to the report as an appendix.

j. Conclusions and Recommendations. This section shall contain the conclusions of the Principal Investigator regarding all contract activities. The success of project activities in addressing research problems discussed in the research design shall be discussed.

k. References (American Antiquity style).

l. Appendices (Maps, correspondence, etc.). A copy of this Scope of Work shall be included as an appendix in all reports.

5.04. The above items do not necessarily have to be discrete sections; however, they should be readily discernable to the reader. The detail of the above items may vary somewhat with the purpose and nature of the study.

5.05. In order to prevent potential damage to cultural resources, no information shall appear in the body of the report which would reveal precise resource location. All maps which indicate or imply precise site locations shall be supplied to the Contracting Officer separate from study reports.

5.06. No logo or other such organizational designation shall appear in any part of the report (including tables or figures) other than the title page.

5.07. Unless specifically authorized by the Contracting Officer, all reports shall utilize permanent site numbers assigned by the state in which the study occurs.

5.08. All appropriate information (including typologies and other classificatory units) not generated in these contract activities shall be suitably referenced.

5.09. The study report shall contain site maps indicating site datum(s), location of data collection units (including shovel cuts, subsurface test units and surface collection units); site boundaries in relation to proposed project activities, site grid systems (where appropriate) and such other items as the Contractor may deem appropriate to the purposes of this contract.

5.10. Information shall be presented in textual, tabular, and graphic forms, whichever are most appropriate, effective and advantageous to communicate necessary information. All tables, figures and maps appearing in the report shall be of publishable quality.

5.11. Any abbreviated phrases used in the text shall be spelled out when the phase first occurs in the text. For example use State Historic Preservation Officer (SHPO)" in the initial reference and thereafter "SHPO" may be used.

5.12. The first time the common name of a biological species is used it should be followed by the scientific name.

5.13. In addition to street addresses or property names, sites shall be located on the Universal Transverse Mercator (UTM) grid.

5.14. All measurements should be metric. If the Contractor's equipment is in the English system, then the metric equivalents should follow in parentheses.

5.15. As appropriate, diagnostic and/or unique artifacts, cultural resources or their contexts shall be shown by drawings or photographs.

5.16. Black and white photographs are preferred except when color changes are important for understanding the data being presented. No instant type photographs may be used.

5.17. Negatives of all black and white photographs and/or color slides of all plates included in the final report shall be submitted so that copies for distribution can be made.

6. <u>Submittals</u>.

6.01. As soon as possible but, in any case, no later than seven (7) calendar days, the Contractor shall submit to the Contracting Officer a management summary describing the numbers, approximate size and general nature of all subsurface cultural deposits located.

6.02. The Contractor shall submit 10 copies of the draft report and one original and 50 bound copies each of the final report which include appropriate revisions in response to the Contracting Officer's comments.

6.03. The Contractor shall submit under separate cover 6 copies of site drawings described in paragraph 5.09, and single copies of all forms, records and photographs described in paragraph 1.04.

6.04. The Contractor shall submit to the Contracting Officer, during the period of service of the contract, brief (one or two page) reports bimonthly describing contract activities during the preceeding 14 calendar days.

6.05. At any time during the period of service of this contract, upon the written request of the Contracting Officer, the Contractor shall submit, within 30 calendar days, any portion or all field records described in paragraph 1.04 without additional cost to the Government.

7. Schedule

7.01. The Contractor shall, unless delayed due to causes beyond his control and without his fault or negligence, complete all work and services under this contract within the following time limitations.

Activity	Due Date (Beginning with acknowledged date of receipt of notices to proceed for Phase I research design)
Submittal of Research Design	14 calendar days
	Due Date (Beginning with acknowledged date of receipt of notices to proceed for Phase I fieldwork)
Phase I Fieldwork	22 calendar days
Submittal of Draft Report	142 calendar days
Government Review of Draft Report	187 calendar days
Contractor's Submittal of Final Report	232 calendar days

7.02. The Contractor shall make any required corrections after review by the Contracting Officer of the report. In the event that any of the Government review periods are exceeded and upon request of the Contractor, the contract period will be extended on a calendar day for day basis. Such extension shall be granted at no additional cost to the Government.

8. Payment.

8.01. Estimates shall be made monthly of the amount and value of the work and services performed by the Contractor under this contract, such estimates to be prepared by the Contractor and accompanied by such supporting data as may be required by the Contracting Officer.

8.02. Invoices shall be submitted monthly for payment on ENG Form 93, Payment Estimate - Contract Performance, in quadruplicate for the amount and value of the work and services performed by the Contractor. Upon approval of such invoices by the Contracting Officer, payment shall be made to the Contractor as soon as practicable of 90% of the invoiced amount. A retained percentage of 10% will be applied to each invoiced amount. If the Contracting Officer determines that the work is substantially complete and that the amount of retained percentages is in excess of the amount considered by him to be adequate for the protection of the Government, he may at his discretion release to the Contractor such excess amount.

8.03. Upon satisfactory completion by the Contractor and acceptance by the Contracting Officer of the work done by the Contractor in accordance with the provisions of this contract, the Contractor will be paid the unpaid balance of any money due for work under said statement, including retained percentages relating to this portion of the work.

8.04. Prior to such final payment under the contract, or prior to settlement upon termination of the contract, and as a condition precendent thereto, the Contractor shall execute and deliver to the Contracting Officer a release of all claims against the Government arising under or by virtue of this contract, other than such claims, if any, as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.

ORIGINAL

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE | PAGE OF PAGES

2. AMENDMENT/MODIFICATION NO.: P00006

3. EFFECTIVE DATE: 85 JUN 20

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. (If applicable)

6. ISSUED BY — CODE W38XGR

Department of the Army
Memphis District, Corps of Engineers
B-202 Clifford Davis Federal Building
Memphis, Tennessee 38103-1894

7. ADMINISTERED BY (If other than Item 6) — CODE

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

New World Research, Inc.
Post Office Box 410
102 Pine Street
Pollock, Louisiana 71467

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X 10A. MODIFICATION OF CONTRACT/ORDER NO.: DACW66- 82-C-0090

10B. DATED (SEE ITEM 13): 82 JUL 30

CODE | FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning ______ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14. *

(√) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

X B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [X] is not, ☐ is required to sign this document and return ______ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

*

The contract is for Archeological Mitigation Analysis and Report Preparation for a Portion of Site 3CT50 on Big Creek, Item 2, Crittenden County, Arkansas.

The purpose of this administrative modification is to include the attached "Certification of Overhead Costs (MAR 1985)' clause to the contract as directed by Acquisition Letter (AL) 85-14, "Certification of Overhead Costs" dated 25 Mar 85.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Donald E. Willhouse
Maj, Corps of Engineers

15B. CONTRACTOR/OFFEROR
______
(Signature of person authorized to sign)

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA
BY Donald E. Willhouse
(Signature of Contracting Officer)

16C. DATE SIGNED: 6 JUL 85